TECHNOLOGY DEPT.

Construction Methods and Equipment

First Copy

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December, 1938
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TRUCK MIXER DELIVERS CONCRETE *to 3-cu. yd. bucket handled by long-boom crane on Olentangy Village multiple-dwelling housing project, Columbus, Ohio.*

This Month:

The first of a number of articles on industrial and employee relations in the construction industry:

A Review of Labor Conditions in the Construction Industry

By ARTHUR A. JOHNSON
President, The Arthur A. Johnson Corp., Engineers and Contractors, New York

★

Building Olentangy Village, a Private Housing Project of 402 Living Units

★

How Modern Earth-Movers Leveled 200-Acre Hilltop Site For Strip Mill

★

Cold Weather Concreting on Nine-Span Bridge

★

Earth-Moving Yardage Boosted by Pusher Tractor Behind Scraper

Work out the idea with INLAND

Some piling installations and other construction projects move along much more smoothly from planning stages to completion than others. One important reason is the kind of co-operation the contractor or fabricator gets and knows he can depend upon from the steel maker.

Inland, because it is good sized, well co-ordinated and well located, offers facilities that can be quickly adjusted and applied to the individual job.

Experienced and capable Inland field men are ready to advise and aid in working out shortcuts to lower construction costs. There's no red tape in the Inland organization. Your Inland field engineer has direct daily contact with mill executives. Not only can he assure prompt delivery but also secure maximum co-operation all along the line.

You'll find it easier to work out your ideas and complete your jobs with this prompt and dependable organization. You will also find the Inland Piling Calculator and Inland Piling Catalog very helpful in working on jobs. A word will bring them to you.

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TECHNOLOGY DEPT.

CURRENT JOBS

. . . . and Who's Doing Them

BUILDINGS

Public—A $8,242,000 contract for the superstructure of the Queensbridge housing project in Long Island City, N. Y., was awarded by the New York City Housing Authority to **Cauldwell-Wingate Co.**, of New York. The Municipal Housing Authority of Buffalo, N. Y., let a contract amounting to $3,000,000 for the Lake View housing project in that city, to **H. M. Dechert, Inc.**, local contractor. Low bidder for a federal penitentiary in Terre Haute, Ind., was the **Great Lakes Construction Co.**, of Chicago, with a tender of $2,173,300. A bid of $2,057,000 obtained for **John McShain, Inc.**, of Philadelphia, general contract for a state industrial school in White Hill, Pa. In College Station, Tex., a 6-story college dormitory building costing $1,338,000 will be built by **Bellows Construction Co.**, of Houston, Tex. The federal Veterans Bureau has engaged **Wilaka Construction Co.** to erect a $1,908,900 addition to a hospital in the Bronx, New York City. A building for the Veterans Administration in Amarillo, Tex., is under construction by **W. S. Bellows Construction Co.**, Oklahoma City, Okla., for $617,000. Successful bidder for a state prison building in Mount Gretna, Pa., was **McCloskey & Co.**, of Philadelphia, with a price of $1,469,000. Washington, D. C., is to have a new municipal court building to be constructed by **G. Hyman Construction Co.**, of Washington, D. C., for $1,233,720. A bid of $1,779,000 obtained for the **D.M.W. Contracting Co.**, Brooklyn, N. Y., contract for an administration building at Bellevue Hospital, New York City. In Danbury, Conn., a federal prison contract went to **E. C. Rappoli Co., Inc.**, of Cambridge, Mass., for $1,296,000. Navy barracks at Parris Island, South Carolina, are under way by **J. A. Jones Construction Co.**, of Charlotte, N. C., for $1,044,400. The Syracuse (New York) Housing Authority have received a low bid of $1,110,325 from **W. L. Crow Construction Co.**, of New York City, for a housing project. Navy quarters in Pensacola, Fla., with bid in for $1,403,993, by **Algernon Blair**, of Montgomery, Ala. For a post office annex in Providence, R. I., **George A. Fuller**, of Boston, Mass., was successful bidder with price of $895,000. Barracks at Marine Corps Base, in San Diego, Calif., went to **M. H. Golden**, local contractor, for $810,280. In Chicago, **Simpson Construction Co.**, of Chicago, will build a $749,850 hospital. A high school in Detroit, Mich., was bid in for $545,000 by **A. W. Kutsche Co.**, local contractor. For a hospital in Fort Worth, Tex., bid of $520,200, obtained contract for **J. I. Barnes Construction Co.**, of Loganport, Ind.

Industrial—A $775,000 warehouse in Chicago, Ill., will be constructed by **Enjay Construction Co.**, of Chicago. For a paper mill in Crossett, Ark., successful bidder was **Rust Engineering Co.**, of Pittsburgh, with price of $700,000. **The Western Supply Co.**, of Tulsa, Okla., is building a $370,000 gasoline plant in Corpus Christi, Tex. For enlargements to gasoline refinery in Ponca City, Okla., $1,250,000 contract was let to **M. W. Kellogg Co.**, of New York City.

Commercial—A $6,000,000 housing development in Forest Hills, N. Y., to be known as Queens Valley Estates, will be undertaken by **Taylor-Woodrow Estates, Ltd.**, of Forest Hills. At Rockefeller Plaza, New York City, **Hegeman-Harris Co.**, of New York, is building a $3,000,000 16-story office building. Housing project in Buffalo, N. Y., to consist of 330 residences known as Amherst Gardens, will be built by **Parklap Construction Corp.**, of New York, for $1,750,000. In Stamford, Conn., **Spelke Construction Co.**, local contractor, is engaged on a $900,000 4-unit apartment development.

HIGHWAYS

Recent highway contracts awarded included the following: New York: Grading and embankment for Shore Parkway along Gravesend Bay, $724,314, to **Standard Dredging Co.**, of New York City; hydraulic fill on same project, $958,500, to **Gahagan Construction Co.**, of Brooklyn, N. Y. Concrete paving, 5.3 mi., in Sullivan County, to **T. A. Brogan**, of Yonkers, N. Y., for $319,661. Mississippi: Improving 12.7 mi. in Harrison County, $243,876, to **Harbert Cargile Construction Co.**, of Birmingham, Ala.; 11.4 mi. in Montgomery County, $225,189, to **Trinidad Asphalt Mfg. Co.**, of St. Louis, Mo.; 13.1 mi. in George and Greene Counties, $243,076, to **Hardaway Contracting Co.**, of Columbus, Ga. Illinois: 5.3 mi., Cook and Kane Counties, $230,098, to **Milburn Bros., Inc.**, of Mt. Prospect, Ill.; 5.8 mi. in Bureau County, $266,691, to **Trompeter Construction Co.**, of Peru, Ill. South Carolina: 5.4 mi. in Sumter County, $331,470, to **John E. Ballenger Construction Co.**, of Lakeland, Fla. New Mexico: Road building in Chaves County, $489,829, to **H. Thgesen**, of Albuquerque, N. Mex. Louisiana: Asphalt paving in Orleans Parish, $392,787, to **Craven-Lang Co.**, of New Orleans. Texas: Improving 8 mi. in Montague County, $220,832, to **Austin Road Co.**, of Dallas. Pennsylvania: Highway and traffic circle construction in Philadelphia County, $431,462, to **Union Paving Co.**, of Philadelphia. Ohio: 4.3 mi. in Muskingum County, $414,964, to **W. P. McCarren**, of Walhounding, Ohio. California: Road and bridge construction in Santa Clara County, $355,732, to **Grandfield-Farrar & Carlin**, of San Francisco. Virginia: 12.9 mi. in Patrick County, $355,285, to **V. McKenzie Co.**, of Dearborn, Mich.

SEWERS

Sewer tunnel in Rochester, N. Y., went to **Tomack Subsidiary, Inc.**, of Rochester, for $738,617. Relief sewer in Boston, Mass., was let to **Edward M. Matz, Inc.**, of Jamaica Plain, Mass., for $318,158. Cincinnati, Ohio, is having the **Ferro Concrete Construction Co.** of that city build an incinerator plant for $267,450. In Thibodaux, La., **Sullivan, Long & Haggerty**, of Bessemer, Ala., are building a $204,000 sewer. Sewage treatment plant in New Castle, Ind., is under construction for $224,300, by **T. Buesching**, of Fort Wayne, Ind. Successful bidder for sewer in Oregon, Ill., to cost $188,808, was **Santucci Construction Co.**

Construction Methods and Equipment

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DECEMBER, 1938

ROBERT K. TOMLIN, Editor
A. E. PAXTON, Manager

A McGRAW-HILL PUBLICATION

Editorial Staff: Vincent B. Smith, Paul Wooton (Washington), Nelle Fitzgerald

The "How" of it

For the benefit of readers concerned with the practical application of method or equipment the following references are to articles or illustrations in this issue that tell:

How PILE-DRIVING CRANE was equipped with detachable steam boiler unit. — p. 29
How HOUSING PROJECT utilized transfer batching of truck mixers for foundation concrete. — p. 34
How SACKED CEMENT, delivered to warehouse by truck, was stacked on skids for handling by lift trucks. — p. 35
How TIMBER RAMP BLOCKS raised rear end of truck-mixer to permit discharge into 1-yd. bucket. — p. 36
How GRAVITY CHARGING of batching plant was made possible by side-hill set-up. — p. 37
How WINTER CONSTRUCTION required heat protection for concrete on bridge deck. — p. 38
How STEAM JET SYSTEM was installed to protect bridge concrete during freezing weather. — p. 38
How EARTH-MOVING EQUIPMENT leveled hilltop for site of big steel strip mill. — p. 42
How GOOSENECK CRANE erected roof trusses for tin mill building. — p. 43
How DOUBLE-CHAMBERED CONCRETE PUMP forced batches through long pipe line to building foundations. — p. 44
How PAVING MIXER, using hot water, placed concrete floor slab for mill building during winter. — p. 44
How VEHICLE SPEED influences costs of construction haulage — p. 46
How PERFORMANCE CHART may be used to solve problems of haulage. — p. 47
How TRUCK-MOUNTED DRILL dug holes for cast-in-place concrete piles. — p. 48
How SHEEPSFOOT ROLLER was designed with feet that can be replaced when worn out. — p. 48
How DITCH CHECKS halted soil erosion. — p. 48
How ADJUSTABLE FORMS served series of transitions in building counterforts for flood wall. — p. 49
How MULTIPLE FORMS, lined with plywood, speeded construction of octagonal columns. — p. 49
How COFFERDAM of steel sheetpiling was prefabricated to fit contour of channel bottom. — p. 50
How FLOATING DERRICK lowered 135-ton prefabricated cofferdam sections to place in deep water. — p. 51
How FLOATING CONCRETE PLANT deposited tremie concrete through chute from tower hopper. — p. 51
How PUSHER TRACTOR speeded loading of carryall scrapers on road-building job. — p. 52
How GROUTING CONVERTED old cinder fill into stable foundation for steel mill buildings. — p. 65

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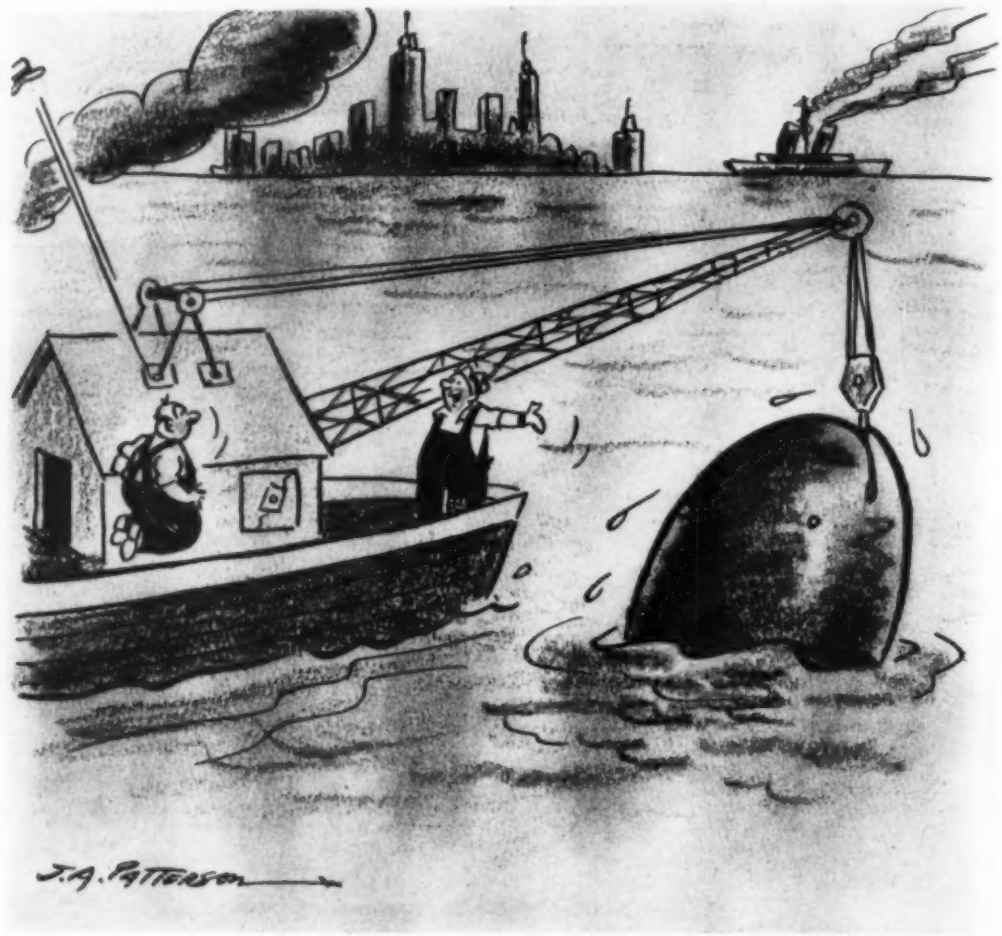
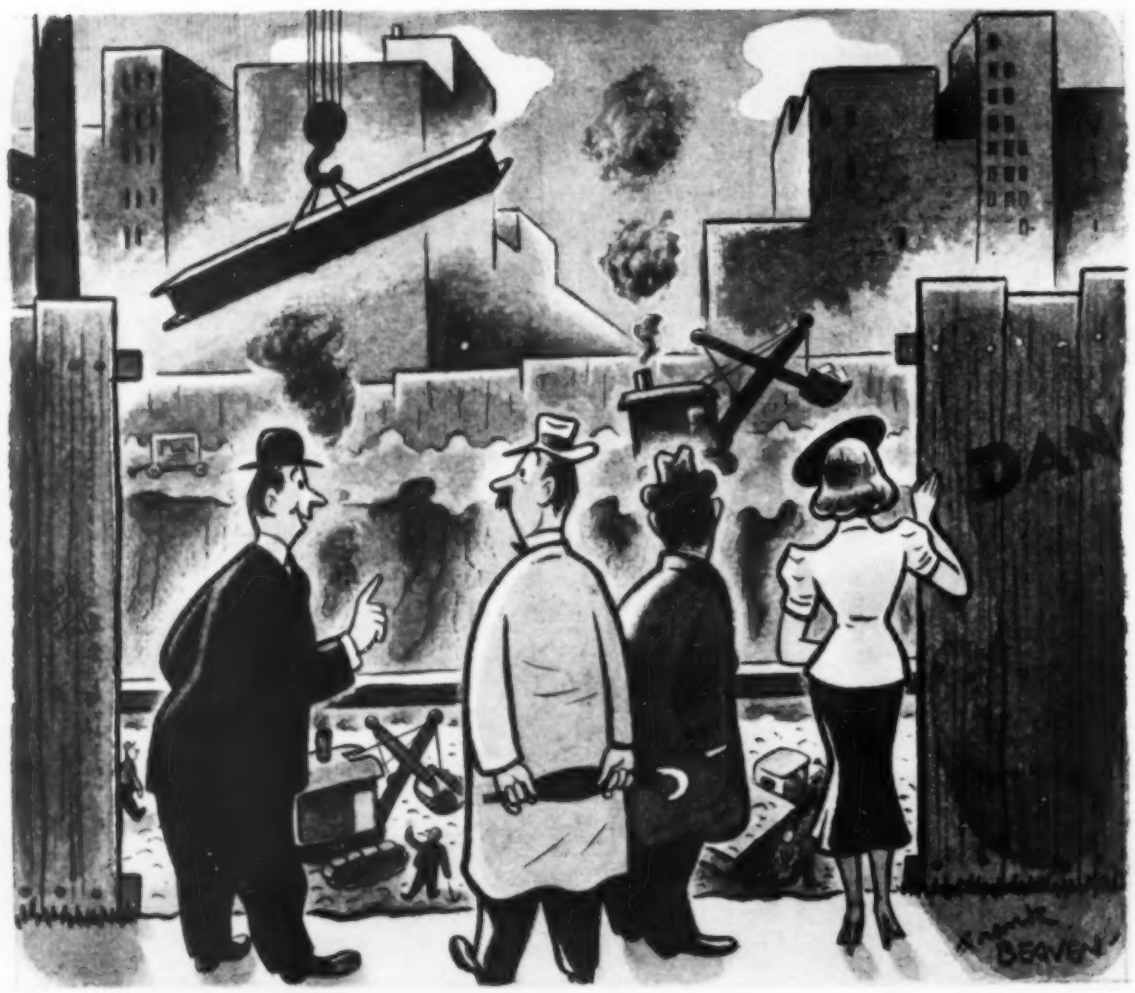


Look, just for fun, I put a worm on it!"



"I just got here — how did it start?"

FEED 'EM AND WEEP

USE 'INCOR'—AND CUT HEAT-PROTECTION COSTS BY 50 TO 60%

IT pays to remember that the quicker concrete hardens the less time and expense are required to provide costly heat-protection. There's no profit in dumping coke into the greedy maw of a salamander.

'Incor' 24-Hour Cement saves real money on cold-weather work because it gains strength faster and the concrete is safe from freezing sooner. Heat mixing water and aggregates, as usual; then, with 'Incor',* simply provide heat-protection for 24 hours after concrete is placed. That saves, at very least, two days' heat-curing. Typical example:

6-story-and-roof concrete-frame building — 100' x 100' in plan

To provide heat: one salamander per 330 sq. ft., 30 salamanders per floor

Operating Costs:

Coke, 5 tons a day, at $10	$50 per day
Labor, 4 men tending fires, at $5 ...	$20 per day
Heat cost	$70 per day

'Incor' Saves Heat-Protection Costs:

2 days' heating expense per floor	$140
For 6 stories and roof	$980

To these fuel and labor savings, also add reduced form costs and lower job overhead as well. Why not figure these savings on work now in progress? Write for copy of "Cold-Weather Concreting." Lone Star Cement Corporation, Room 2272, 342 Madison Avenue, New York. *Reg. U. S. Pat. Off.

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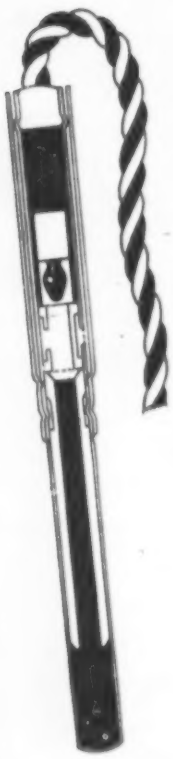

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Certainly this development is a great step forward in *safer blasting*. Ask the Atlas representative for full details.

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- GREATER CAPACITY
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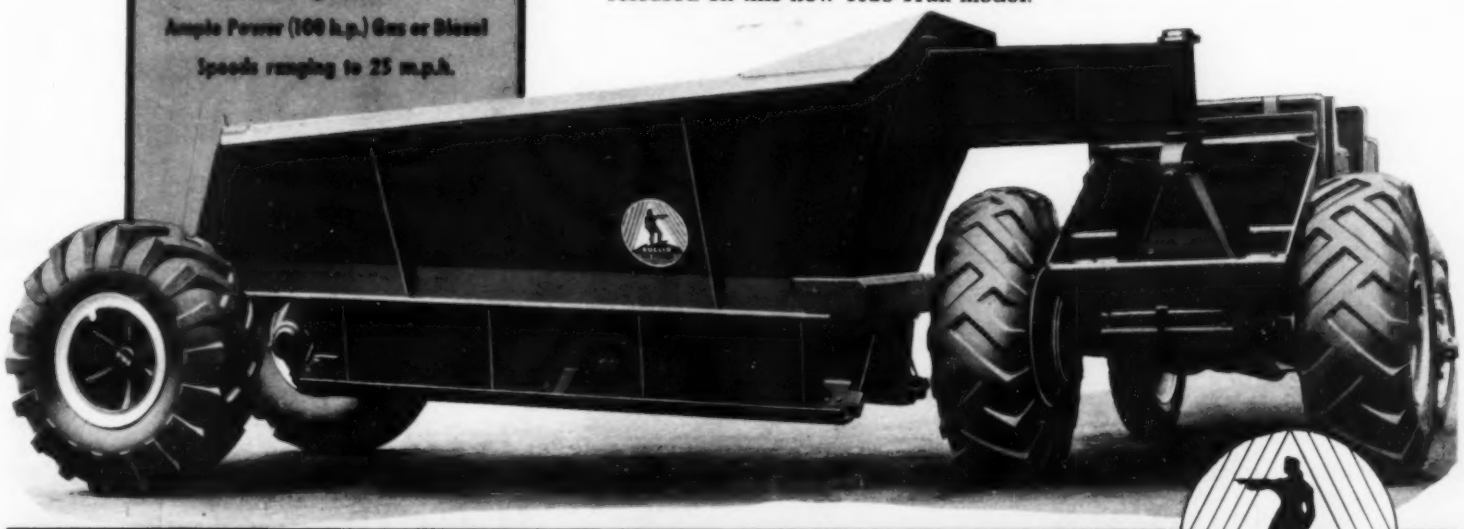
MODEL **K**

GAS OR DIESEL

9 Yards Struck Measure
11 Yards Rounded Load
4-Wheel Air Brakes
Full Floating Tractor Axle
Ample Power (100 h.p.) Gas or Diesel
Speeds ranging to 25 m.p.h.

Maintaining basic features that gained Trac-Truks unquestioned leadership in hauling more profitably—the new Model K *steps ahead* with greater per hour productivity. Yardage has been increased by the new body design which shifts more of the pay load ahead over the drive wheels, gaining more tractive weight which translated into results means more *full loads* hauled. Rear end drag is down to a minimum—the clearance is higher (40") which further increases the dumping efficiency for which Trac-Truks have always been noted.

Well built for a long trouble-free life of heavy duty service, this new model has already proved a revelation in actually establishing a better production record. Write for complete descriptive literature just released on this new Trac-Truk model.



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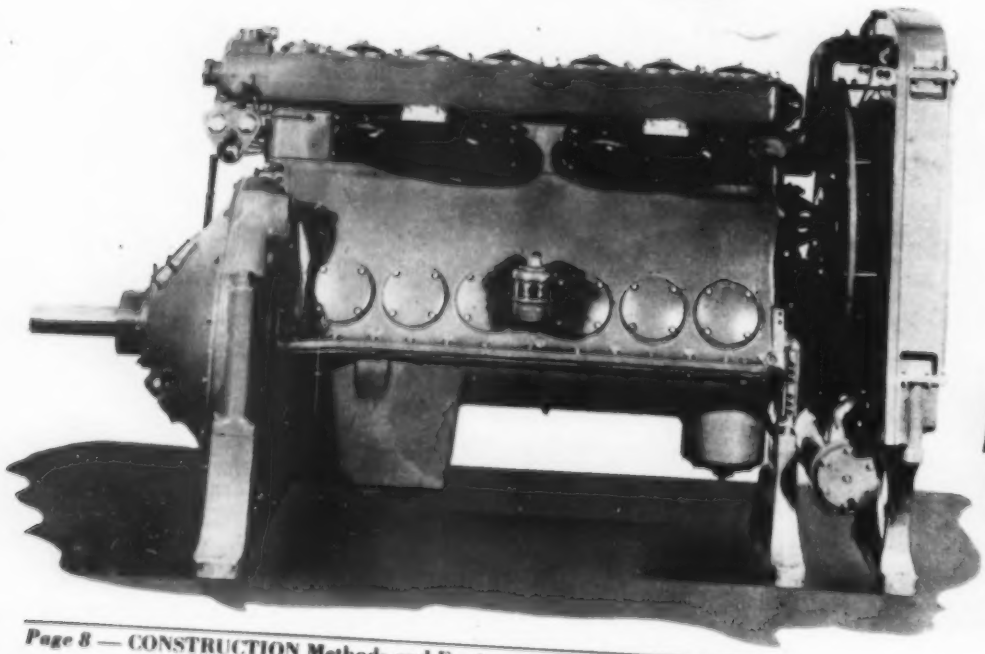

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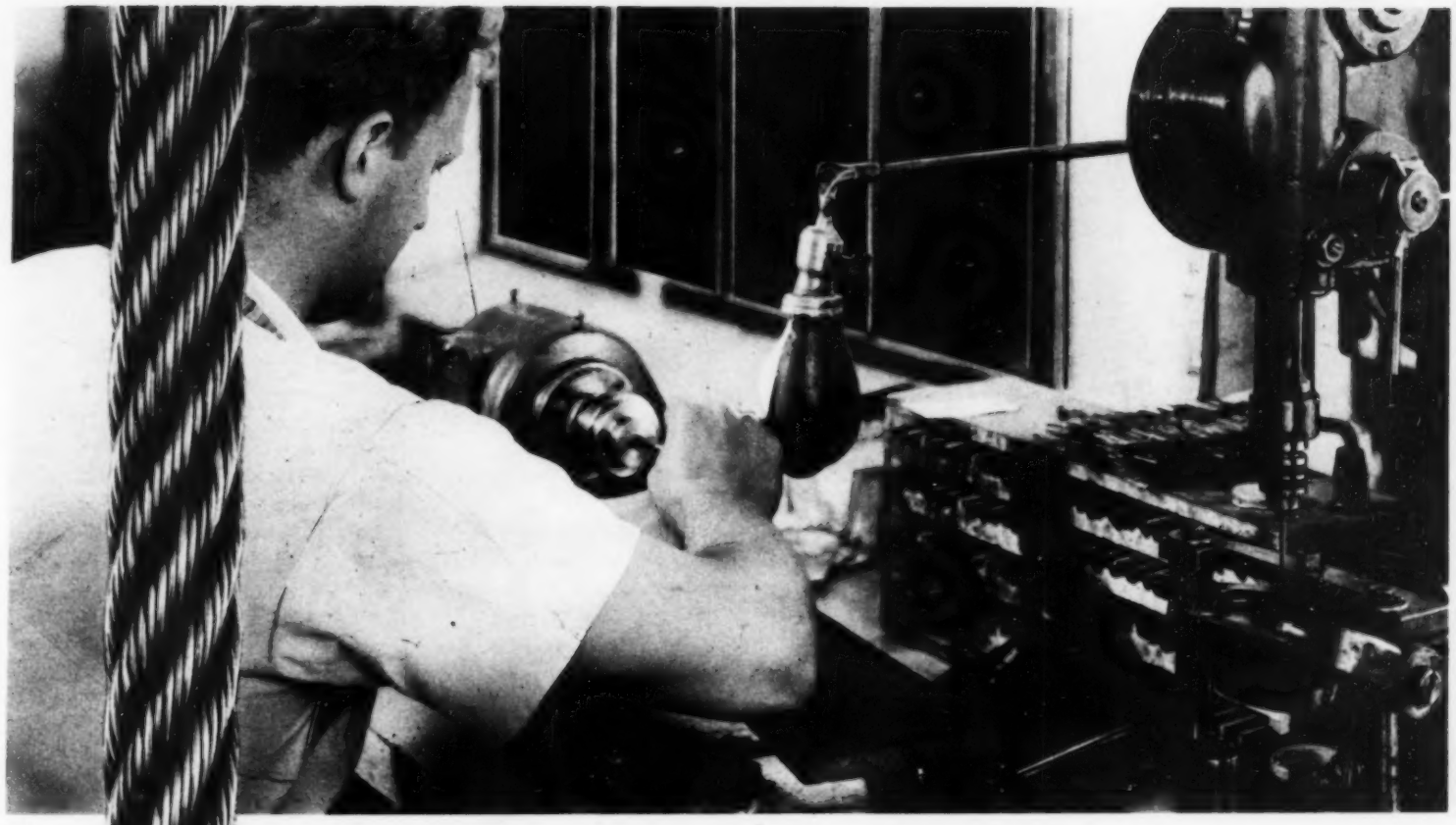

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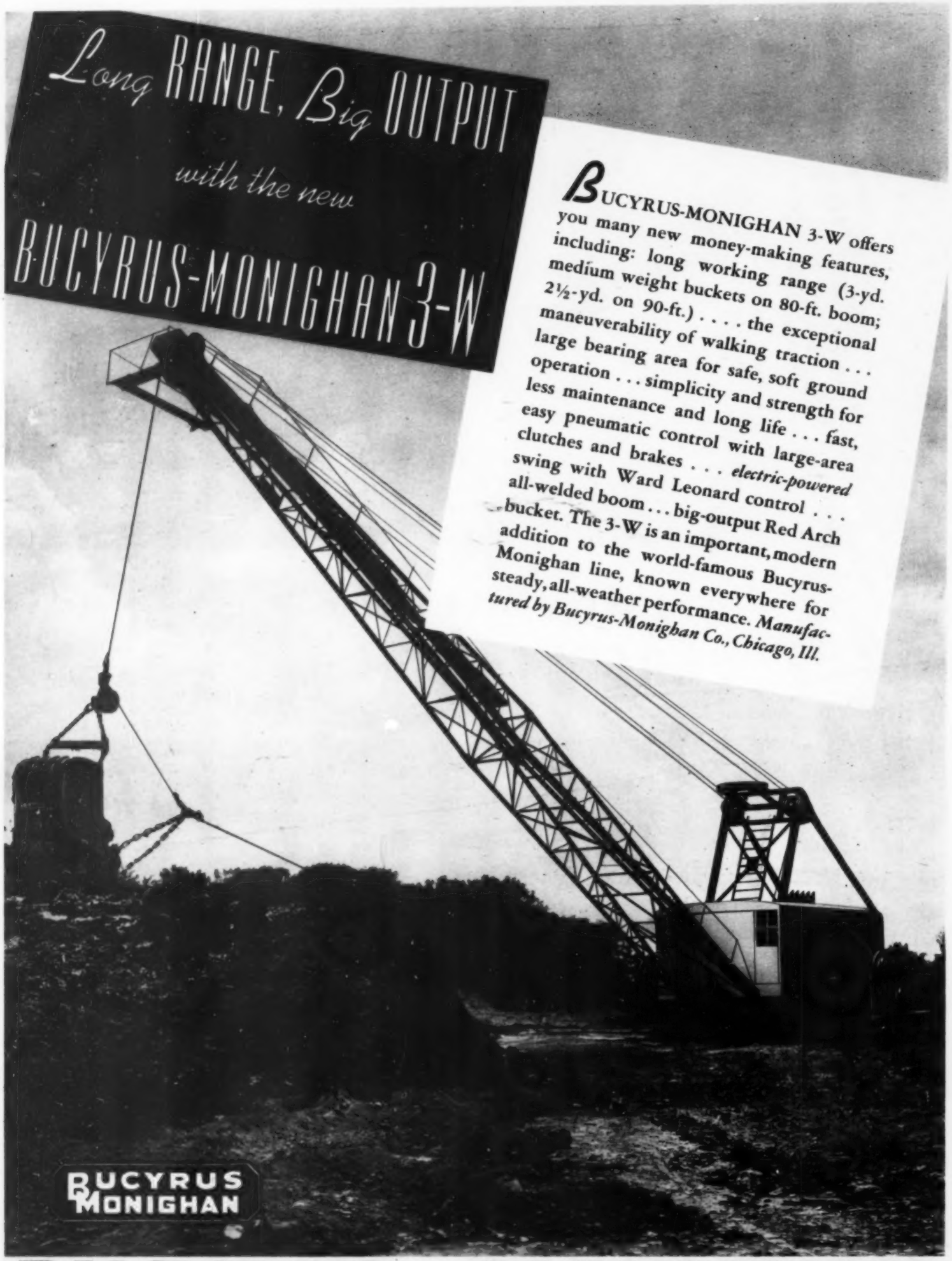
with the new

BUCYRUS-MONIGHAN 3-W



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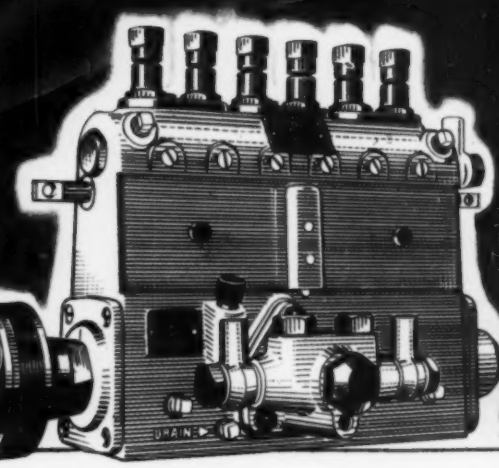

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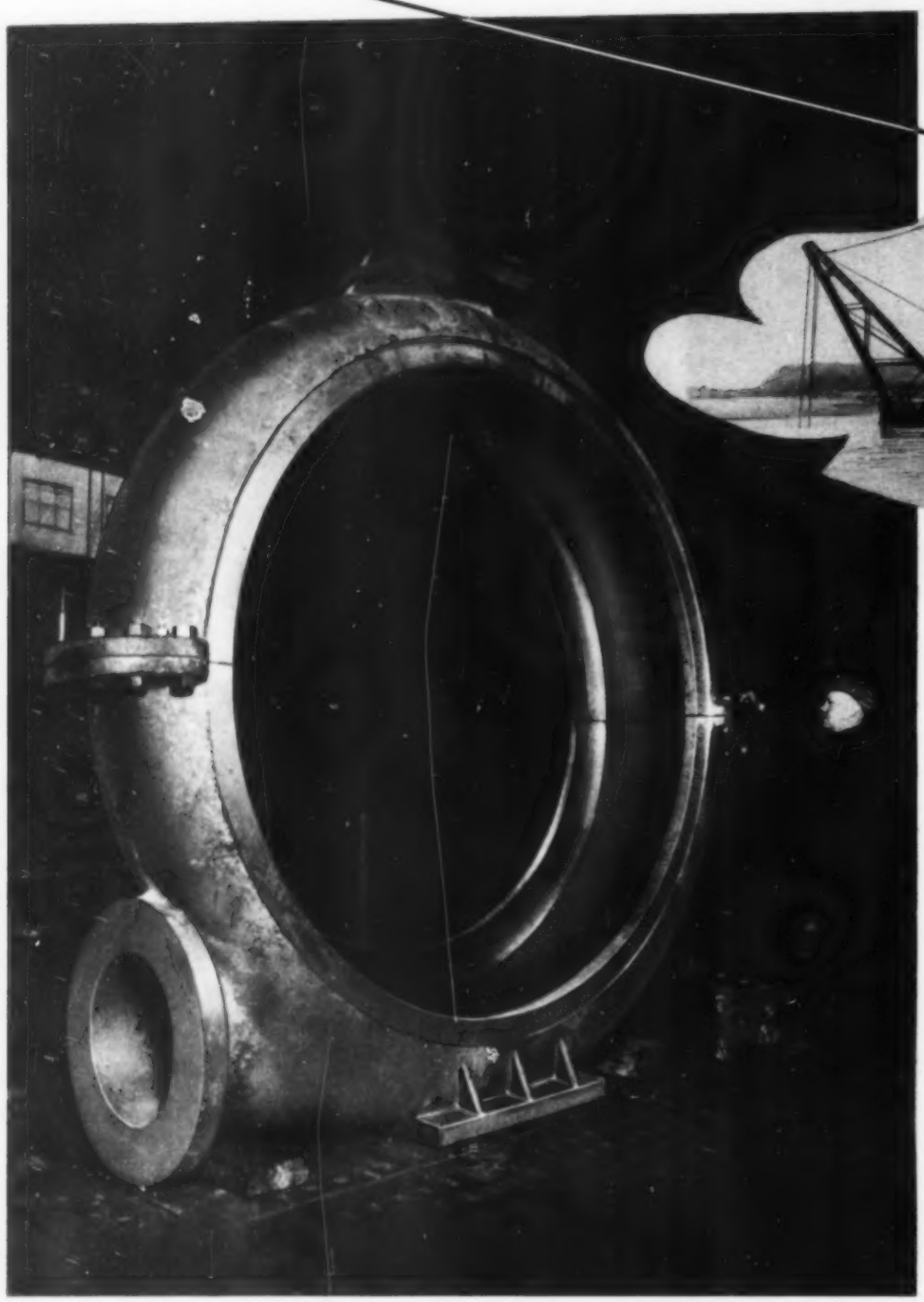

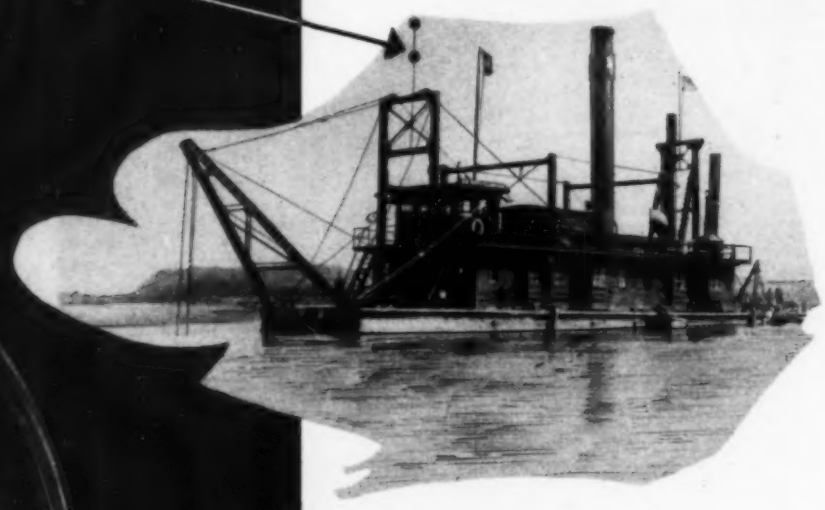

WITH THE HELP OF

ALLOY NICKEL STEELS

CHARGED with clearing thousands of miles of river and harbor channels, U. S. Army engineers have no spare time for the command "halt" to replace dredge parts which wear prematurely or break.

Safeguarding against such delays, this high-strength cast steel casing for a 20" pump on the War Department dredge, "DeWitt Clinton", was specified by Army engineers in Nickel-chromium-molybdenum steel, the specified and actual compositions of which are shown in the accompanying table together with the specified and actual physical properties after heat treatment. These were produced by the Penn Steel Casting Company, Chester, Pennsylvania.

Composition	*Specified Range*	*Actual Composition*
Carbon	0.35/0.45%	0.40%
Manganese	0.60/0.90%	0.85%
Phosphorus and Sulphur	0.40% Max.	0.020%
Nickel	1.75/2.00%	1.86%
Chromium	0.60/0.90%	0.86%
Molybdenum ...	0.15/0.30%	0.25%

Physical Properties	*Specified Minima*	*Test Results*
Yield Point (psi) ...	65,000	72,500
Tensile Strength (psi)	100,000	104,000
Elongation in 2".....	18.0%	21.0%
Reduction of Area ...	30.0%	39.7%

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.

Southern Contractor

Lengthens Shovel Life

THE PHOTOGRAPH PICTURES LIMA No. 102 . . . one of the shovels belonging to the Hardaway Contracting Co., Columbus, Georgia. Hardaway keeps its equipment on the various jobs through regular use of Texaco Lubricants.

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Texaco Crater adheres to the wearing surfaces of metal, despite heat, cold, rain, submergence in water. Where other greases drip and wash away, Crater clings.

If you want *your* equipment to last longer, get in touch with Texaco. Trained lubrication engineers are at your service and 2186 warehouses assure prompt delivery. Write or phone the nearest one, or direct your inquiry to:

The Texas Company, 135 East 42nd Street, N. Y. C.

PERFECTLY LUBRICATED

This Lima Diesel-powered Shovel of the Hardaway Contracting Co. is lubricated with Texaco 100%, as follows:

Texaco Ursa in the Caterpillar Engine

Texaco Marfak in the shackles, universals, large anti-friction bearings

Texaco Thuban in gear case

Texaco Cup Greases

Texaco Crater Compound on all wire rope, gear teeth, chain

Free Booklet. *32 pages of money-saving information on the lubrication of gears and wire rope. Shows where to use Texaco Crater Compound, and how.*

Texaco Dealers invite you to tune in The Texaco Star Theatre—a full hour of all-star entertainment — Every Wednesday Night — Columbia Network — 9:00 E.S.T., 8:00 C.S.T., 7:00 M.S.T., 6:00 P.S.T.

TEXACO
REG. T. M.

TEXACO *Crater Compound*

FOR GEARS, CHAINS, WIRE ROPE

Load and Screen

the cheapest way!

BARBER-GREENE Bucket Loaders will load bulk materials from stockpiles to trucks cheaper than any other method.

They can be equipped with single or double deck vibrating screens—giving the cheapest loading and screening.

Bucket Loaders use less power, require less skill. They save truck time, man time, job time. They are used for loading, stripping, light excavating, unloading cars, etc. Their versatility makes them useful the year 'round.

Barber-Greenes with their Floating Boom, Automatic Overload Release, Tank Type Chassis, and other exclusive features are outstanding in quality, dependability, and ease of operation.

Write for full information on the High Capacity Model 82-A or the smaller, less expensive Model 552. There is no obligation.

38-12

BARBER-GREENE COMPANY, AURORA, ILLINOIS, U. S. A.

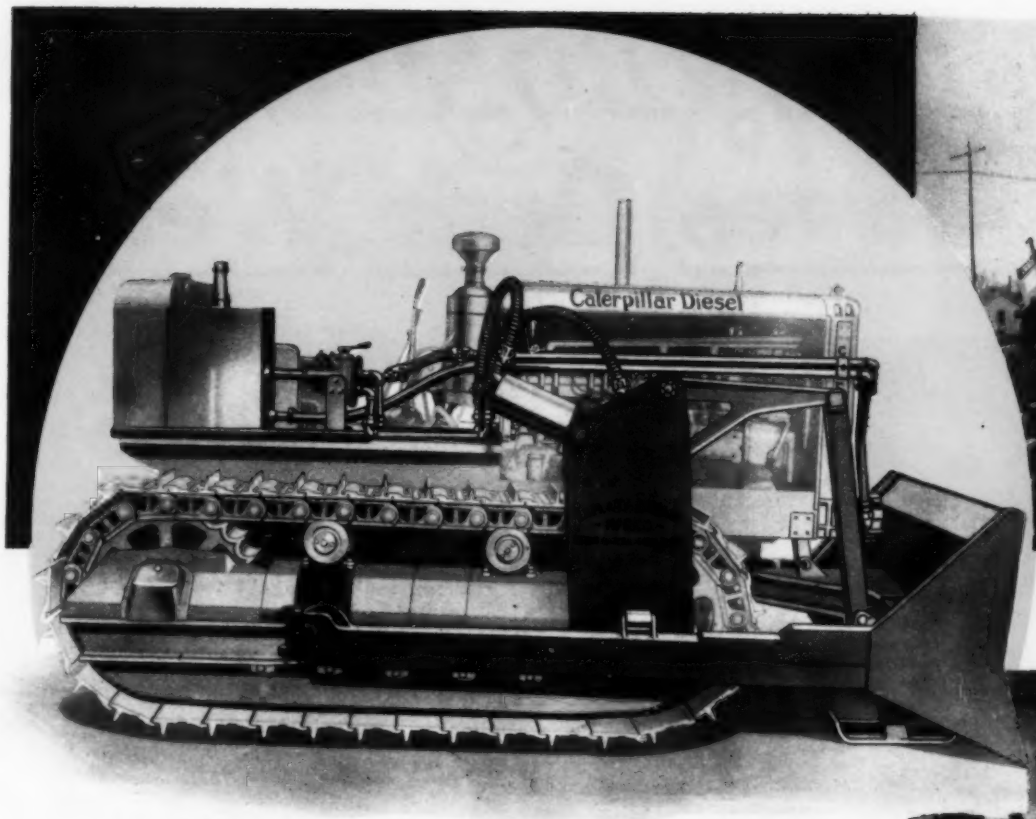
STANDARDIZED MATERIAL HANDLING MACHINES

Representatives in Principal Cities

BARBER GREENE

BRANCH OFFICES

Cleveland · Chicago · New York
Columbus · Boston · Detroit
Cable Address BARGREENE



LAPLANT-CHOATE MEANS Lower Costs

From "*Roughing Out*" to Finishing

LAPLANT-CHOATE BULLDOZERS

Make Extra Profits for You

THOUSANDS of alert contractors praise LaPlant-Choate Bulldozers for the many different earth-moving jobs which they perform easily, dependably and profitably. These hydraulically controlled units give you one economical piece of equipment to replace former methods that were slow, expensive and often dangerous. They remove trees, rocks, stumps; knock down windrows; push material within easy reach of draglines and shovels; spread grade and do many other jobs. You get more work at a lower cost per yard moved.

Because LaPlant-Choate Bulldozers do this work at a saving in time and effort, they make money for you. Positive, finger-tip, hydraulic control of the track-mounted blade makes this possible. The blade, with its superior cutting angle and cutting edges, can be instantly and rigidly locked in any position or raised and lowered with a full load. Unfailing down pressure makes the Bulldozer blade dig surely and accurately.

LaPlant-Choate hydraulic control gives your operator such easy, accurate control of the blade that your Bulldozer also does fine finishing work.

There are thousands of LaPlant-Choate Bulldozers doing a wide variety of jobs dependably and profitably the world over. Put this equipment to work saving and making money for you. Write today for free circular.

La Plant-Choate Bulldozers are designed exclusively for use on "caterpillar" track-type tractors. This assures you of a properly balanced, thoroughly coordinated unit. The Bulldozer blade is track-mounted to prevent stress and strain on the tractor frame and body. Because LaPlant-Choate Bulldozers are built with the rugged strength to withstand the toughest usage, you are singularly free from delays and breakdowns.

The Bulldozer can be easily and almost instantly removed. Your "Caterpillar" track-type tractor is then available for other jobs. Get full details on this complete unit from your LaPlant-Choate and "Caterpillar" dealer

TAMPING ROLLERS
SCRAPERS • TRAILBUILDERS

LA PLANT-CHOATE MANUFACTURING CO. Inc.

RUBBER WHEELED WAGONS
BRUSH CUTTERS • SNOW PLOWS

CEDAR RAPIDS, IOWA.

GULF LUBCOTE

Saves Gear Wear!

GULF LUBCOTE is especially adapted to service on gears exposed to the weather, such as shown above.

This tough, tenacious lubricant has remarkable adhesive properties

It stays on! When you apply Gulf Lubcote to open gears you have maximum protection against corrosion, pitting or excessive wear. This heavy-bodied lubricant has great adhesiveness for metal surfaces, yet it is sufficiently mobile to insure proper spreading between sliding surfaces under heavy pressure.

Gulf Lubcote retains its original fluidity and high lubricating qualities to a remarkable degree, resisting heat and decomposition. It is made in seven grades to fit various gear types, open or enclosed, and to provide for a wide range of operating conditions.

Let a Gulf lubrication engineer check over your equipment and recommend the proper application of the right grades of Gulf Lubcote to your gear trains. You will not be obligated in any way.

Gulf Oil Corporation
Gulf Refining Company
GENERAL OFFICES: GULF BUILDING, PITTSBURGH, PA.

GULF INDUSTRIAL LUBRICATION

FOUR REASONS . . . WHY GULF LUBCOTE IS THE LUBRICANT OF UNPARALLELED QUALITY FOR OPEN GEARS

1 GULF LUBCOTES are heavy-bodied products especially manufactured to have the requisite property of high adhesiveness for metal surfaces necessary in lubricants for open gears.

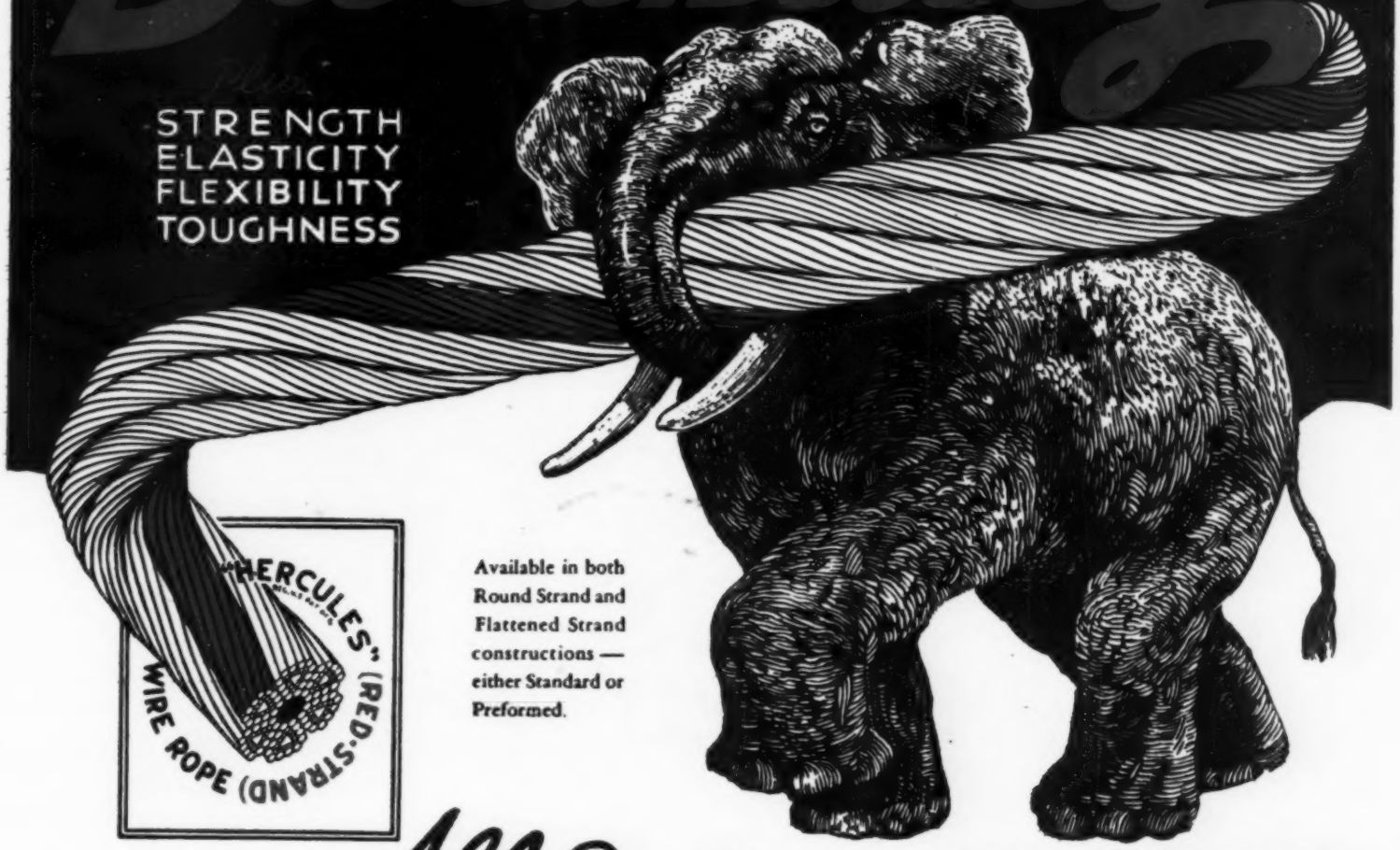
2 Due to selected crudes used and to the process of refinement employed, GULF LUBCOTES possess unusual lubricating qualities together with the essential property of flowing with the movement of the gear and pinion teeth.

3 The lubricating film provided by GULF LUBCOTES, in addition to being impervious to moisture, acid fumes and gases, will withstand extreme temperature changes without deterioration.

4 Due to the tough and tenacious nature of GULF LUBCOTES they will effectively reduce objectionable gear noise and at the same time will provide maximum protection against corrosion, pitting or excessive wear of the gear teeth.

Durability

STRENGTH
ELASTICITY
FLEXIBILITY
TOUGHNESS

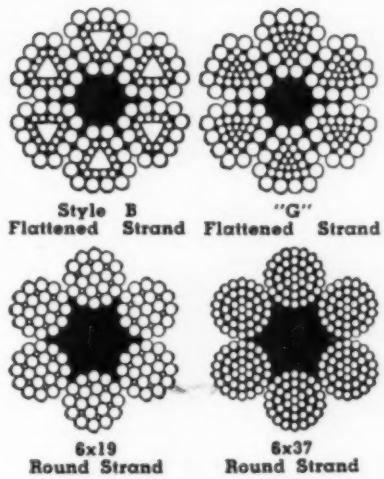


Available in both Round Strand and Flattened Strand constructions — either Standard or Preformed.

All Perfectly BALANCED

Durability means long life. In Wire Rope it means the ability to resist the wear and tear that wire rope encounters in service.

"HERCULES" (Red-Strand) Wire Rope has maximum durability because the vital factors to produce long life are built into it in balanced proportion. Strength . . . toughness . . . elasticity and flexibility, all perfectly balanced in "HERCULES" (Red-Strand) produce that fifth vital characteristic of durability.



It is the presence of all the essential factors in every length of "HERCULES" (Red-Strand) Wire Rope that makes it perform better and last longer. Your own cost charts will show you how big the difference is.

If you will tell us how you use wire rope, we shall be glad to suggest the construction we consider best for your particular conditions.

MADE ONLY BY

A. Leschen & Sons Rope Co.

ESTABLISHED 1857

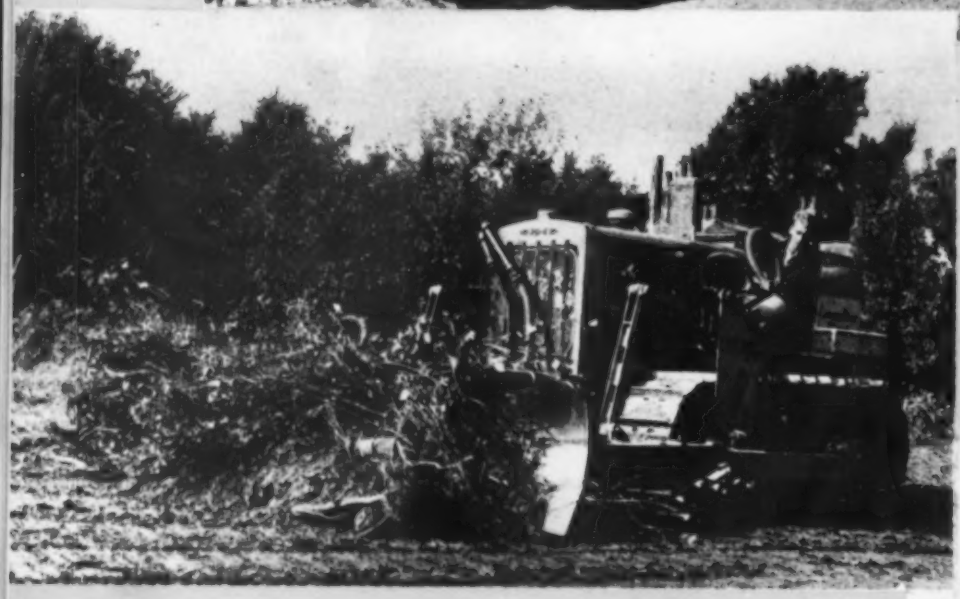
5909 Kennerly Avenue, St. Louis, Mo.

New York.....90 West Street
Chicago.....810 W. Washington Blvd.
Denver.....1554 Wazee Street
San Francisco.....520 Fourth Street
Portland.....914 N. W. 14th Avenue
Seattle.....3410 First Avenue South

LONDON
ENGLAND
RESERVOIR

ONE OF

A panorama which shows part of the "Caterpillar" fleet of 36 units at work on Staines Reservoir, London, England. The wagons are 10-yard Atheys. The "Caterpillar" Diesel Elevating Grader . . . hauled by a "Caterpillar" Diesel Tractor . . . travels continuously at the rate of 2 to 3 miles per hour, cutting a furrow 12 to 20 inches deep and approximately the same width.



A "Caterpillar" Diesel D6 Tractor, with a LaPlant-Choate bulldozer, does some inexpensive and fast clearing at Staines Reservoir. Plenty of power behind this dozer to dig out brush, stumps and trees. This same machine, with an 8-foot bulldozer, has done some valuable, low-cost leveling on the fill.

This is how the 4,000,000 cubic yards of earth are being moved at the great London Reservoir. Eight "Caterpillar" Diesel Tractors with 16 Athey wagons work with one of these "Caterpillar" Diesel Elevating Graders! Grader and wagons travel continuously during a 20-hour (two-shift) day. Even the dumping is done on the move. The earth is gravel and London clay—and in heaping loads it's going away!

YEAR AHEAD
SCHEDULE

Near London, England, John Mowlem and Company, Ltd., is building Staines Reservoir for the Metropolitan Water Board. It is a mammoth task — hampered by hard gravel and clay, and by frequent London fogs, and by rains that turn the soil to soup. But in spite of difficulties, the reservoir is well on its way to an early completion . . . and, as on so many big projects, "Caterpillar" Diesel equipment is powering the *entire* job!

At work near London are 36 separate "Caterpillar" units: 30 "Caterpillar" Diesel track-type Tractors . . . 4 "Caterpillar" Elevating Graders . . . and 2 "Caterpillar" Blade Graders plus LaPlant-Choate, Athey and LeTourneau equipment. To build Staines Reservoir, they will move 4,000,000 cubic yards of earth and form 6000 linear yards of embankment 50 feet high.

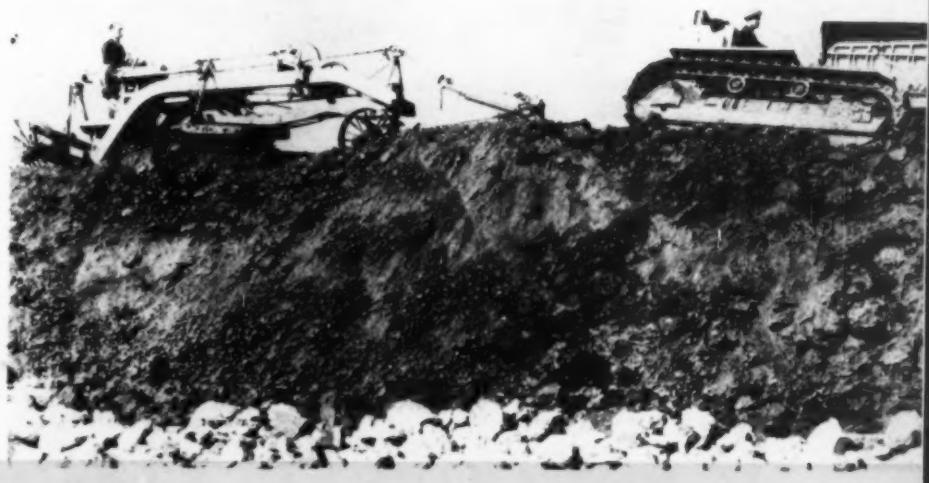
It would be impossible to detail all the aspects of this vast and varied project. But just one instance shows that the work is going ahead with the usual "Caterpillar" efficiency and speed . . . that the "Caterpillar" fleet is delivering maximum yardage.

In a 10-hour day the average for each unit (there are 4 on the job) — consisting of a "Caterpillar" Elevating Grader and "Caterpillar" Diesel Tractors, pulling 10-yard Athey Wagons — is 3330 cubic yards of earth.

Performances like this, combined with economy, earn larger and larger jobs for "Caterpillar" Diesels. Yet no matter how big the jobs get, this power continues to pay its way — *and pile up profits as regularly as it piles up earth!*

On the fill at Staines Reservoir, Athey side-dump wagons, in tandem, travel behind "Caterpillar" Diesel Tractors. As the load rides over the embankment, the operator can dump to either side without stopping—spreading the material over the fill, as evenly as necessary!

A "Caterpillar" Diesel D8 Tractor and a "Caterpillar" No. 66 power-controlled Grader keep the fill, at the Staines Reservoir, dressed all the time. This same outfit is also used for constructing drainage ditches, leveling borrow pits, and building and maintaining roadways.



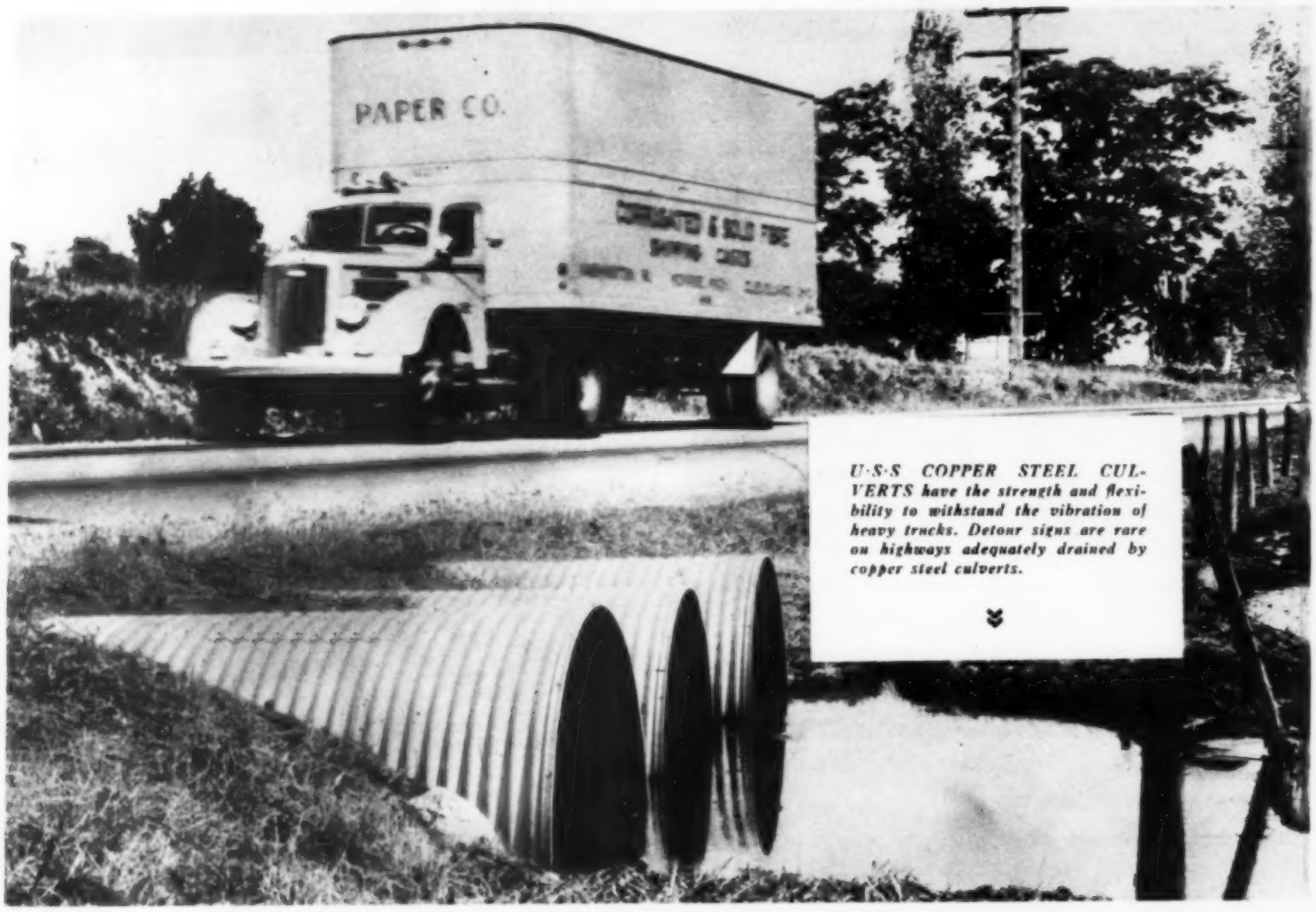
CATERPILLAR

REG. U.S. PAT. OFF.

TRACTOR CO., PEORIA, ILL.

DIESEL ENGINES • TRACK-TYPE TRACTORS • ROAD MACHINERY

HOW TO *Eliminate* COSTLY ROAD REPAIRS



U·S·S COPPER STEEL CULVERTS have the strength and flexibility to withstand the vibration of heavy trucks. Detour signs are rare on highways adequately drained by copper steel culverts.

Culverts of U·S·S Copper Steel prevent washouts, breaks and sunken pavements caused by water in the wrong place.

WATER plays havoc with roads. When not properly controlled, it undermines foundations . . . leads to washouts, breaks, sunken road-beds. The damage that water causes often closes busy highways, ties up men and equipment, increases maintenance costs. The proper use of culverts will do much to make the roads you build last longer and give better service.

U·S·S Copper Steel is the ideal material for culverts. It can be handled more easily and at less expense than rigid, weighty materials. It is less expensive to maintain. Culverts of Copper Steel will not break or crack under the constant pounding of heavy traffic. The corrugated construction has the strength to resist sudden freezes, rapid thaws and sub-soil changes. Further, it has been demonstrated that copper steel culverts have great endurance under alternate wet and dry conditions.

Get all the facts about U·S·S Copper Steel Culverts. Our book will give you the complete story. Why not write for your copy—now.

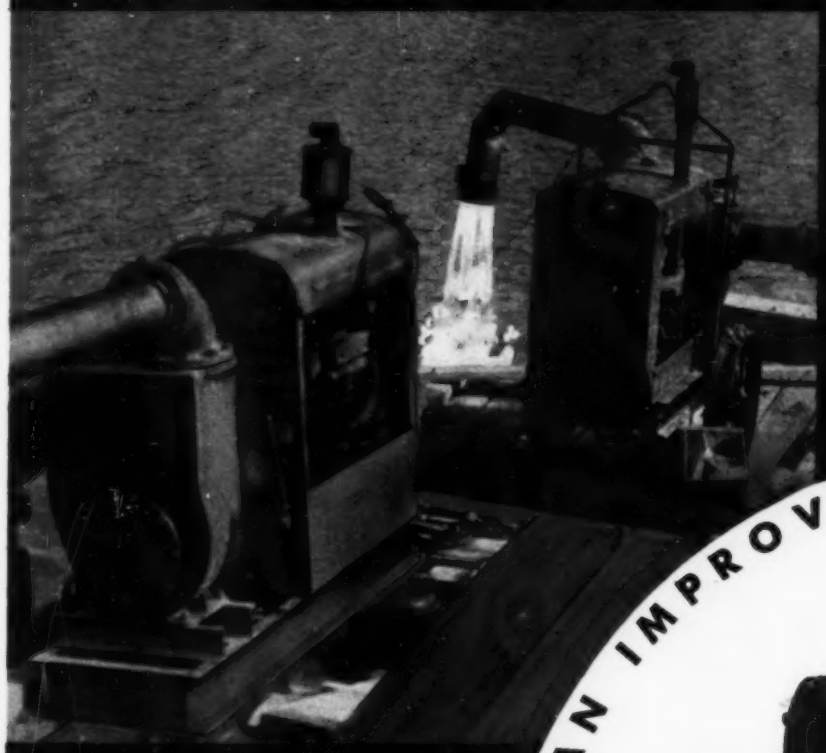
U·S·S COPPER STEEL CULVERT SHEETS

CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*
COLUMBIA STEEL COMPANY, *San Francisco*
TENNESSEE COAL, IRON & RAILROAD COMPANY, *Birmingham*
United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

Where There's Work . . .

NOVO'S on the JOB!



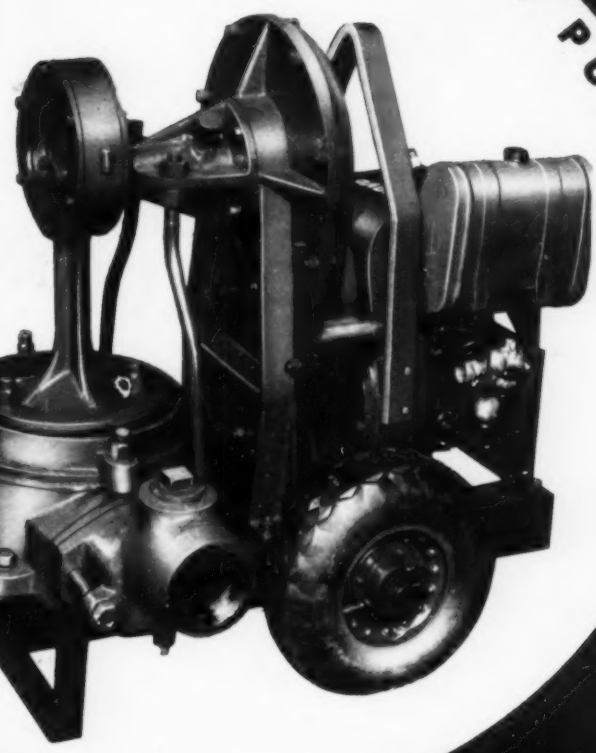
Have you noticed the number of jobs that are now going on which Novo equipment is in evidence?

There must be some relation between the outfits who are getting the work and Novo equipment.

Jobs are tough to get — Novos are the answer to tough jobs. There's the tie-up.

(Left) Here are two 6" Novo Self-Primers on a bridge job now under construction. These two pumps, delivering their full capacity of 90,000 GPH — took down the 18' of water from inside of the sheet piling, and although a tremendous amount of seepage complicated this job, the pouring of concrete footings was accomplished on time.

AN IMPROVED DIAPHRAGM PUMP



(Below) "What a pump!" says Mr. Craft, operator of this Novo Pressure Pump, furnishing water for the boiler on a steam shovel taking gravel out of a creek near Jackson, Kentucky. Owners — the Highland Construction Co. of Louisville, Ky. "The operating cost is practically nil, and it performs in a highly satisfactory manner at all times." This is a Model AU, the smallest of the long line of Novo Pressure Pumps.

Here is your old friend with a new waistline. A new Novo Diaphragm Pump that is: *Light Weight — Modern in Design*, completely enclosed gearing, built-in power unit and Priced much lower.

Send The Coupon

NOVO ENGINE CO.

214 Porter St., Lansing, Mich.

Send me complete information on that

New Diaphragm Pump.... ☐
Also, Self-Priming Centrifugal Pumps ..... ☐
And Novo Pressure Pump ☐
Or Hoists ..... ☐
Pavement Breaker ..... ☐
Light Plants ..... ☐

Name .....

Address .....

LORAIN-40
FORD SCHMIDLER
Get in
on the Ground Floor of
LOWER BASEMENT
DIGGING COSTS
● Dig basements the modern way with a ¾-yd. Lorain-40 backdigger. This versatile machine introduces a new technique in basement digging which makes for important time and cost reductions. Here's how it works and why it saves you time and money.
The Lorain-40 backdigger digs a trench around the four sides of the basement and scoops out the center as it goes . . . ● The machine always works on top, eliminating the digging and backfilling of ramps . . . ● It cuts vertical walls evenly and straight . . . ● Levels and grades the floor . . . ● Digs the corners squarely and neatly . . . ● One man can handle easily the little handwork remaining . . . ● All dirt is transferred to spoil banks for future grading or loaded directly into trucks . . . ● And, just to make the job complete, the Lorain-40 digs the sewer trenches with straight sides and level bottom.
To learn how the Lorain-40 digs basements in 2 to 3 hours—how to set it up for such jobs—send for this catalog containing complete time study reports on several typical operations.
UNIVERSAL CRANE DIVISION • THE THEW SHOVEL CO.
LORAIN, OHIO
THEW CENTER DRIVE
Time Study Reports
DIGGING BASEMENTS
3/4 Yd. LORAIN-40 BACKDIGGER
3/4 YD. LORAIN-40

35° BELOW BUT BLOOMER'S PROFITS CONTINUED

PERFORMANCE SOLD THIS NEW CARRYALL

The principle and performance of cable control . . . and the profits . . . have since sold Bloomer an Angledozer, 8-Yard and more recently, another 12-Yard Carryall (shown). He writes, "We're just completing an 80,000-yard job (inset) on St. Hy. 55, in Langlade County, Wisconsin, on which several of our original operators are today operating these same LeTourneau veterans from the Iron River job. LeTourneau has again proved most satisfactory."

Sudden temperature drops and all the sloppy thaws winter weather brings hang no "Job Closed" sign on Bloomer Construction Company's work. Here's what J. F. Bloomer has to say about a typical winter performance: "On our original LeTourneau job at Iron River, Wisconsin, we moved 420,000 yards with three LeTourneau 12-Yard Carryalls, when the weather was at times 35 below zero . . . and found the Carryalls to be most dependable units."

Three feet of snow covered the ground; frost was 12 inches deep. Yet, a "snap" tractor was used less than one-tenth of the total working time. In stubborn digging that was at times rock-like, each Carryall kept the job moving along at the rate of 70 pay yards every hour, on 600-foot one-way hauls. When temperature climbed, dirt was often wet, then loose and sandy; profits, nevertheless, were consistent. Carryalls are *first* designed to dig — in the hardest of materials at ordinary dirt prices. Blades are specially heat-treated and hard-faced, thus, self-sharpening; are set at a plow-like angle for *natural*, easy digging. Then, the apron is so placed and controlled that the same positive results are obtained in shifty, loose materials and in cement-like formations. Dumping was a "snap" all the time. The positive ejection tailgate instantly forced every load from the Carryall bowl at a touch of the Power Control lever. Because LeTourneau cable control is fast, accurate — as long as the tractor engine continues to turn over — LeTourneau tools keep the job on the profit side in temperatures that stop ordinary methods.

Your "Caterpillar" dealer is ready to open up your job with a convincing LeTourneau demonstration that will prove *every* claim . . . ask him today! He'll do the rest. R. G. LeTOURNEAU, INC., Peoria, Illinois; Stockton, California. Cable address: "Bobletorno."

Stay in Business this Winter with

LETOURNEAU

CARRYALL SCRAPERS

Angledozers,* Buggies,* Bulldozers, Carryall* Scrapers, Cranes, Drag Scrapers, Power Control Units, Rooters,* Sheep's Foot Rollers, Treedozers. * Name registered U. S. Patent Office.

REPEATED USE OF QUICK SERVICE CONCRETE

at LEHIGH UNIVERSITY

Chemical Laboratory: Averted frost damage without heat-protection expense

Forms stripped in 1/4 usual time. Form costs 50% less.
Lehigh University, Bethlehem, Pa. Floor Contractor: Hoch Contracting Co., Allentown, Pa.

Dormitory: Expedited schedule for occupancy when college opened

Concreting for the first floor of the Chemical Laboratory was completed with Lehigh Normal Cement. The job had to be expedited. Cold weather was due and frosty nights would have made heat protection necessary with normal portland cement. With the approval of the supervising architect, the job was completed with Lehigh Early Strength Cement. From previous experience Mr. Hoch knew he could depend on it to produce service strength concrete of the finest quality three to five times faster than normal cement. Consequently, forms were removed and re-used in one-quarter the usual time—50% was saved on form costs. Concrete for each floor quickly cured beyond freezing danger—there was no heat-protection cost. Quick use of rough floors permitted continuous construction and speeded the entire job.

Mr. Hoch again took advantage of quick service concrete for all the floors for the new Dormitory. Speed was vital—occupancy was required at opening of college. Not only was the work speeded to on-time completion, but relatively the same savings in form costs resulted as in the case of the Chemical Laboratory.

You can apply the advantages of speed with Lehigh Early Strength Cement to any concrete construction. Use it when concrete must be put to work quickly. Use it to reduce overhead by shortening construction time. To save on form cost by prompt re-use. To safeguard concrete against cold weather—to reduce heat-protection costs. Use it to coordinate construction schedules by speeding up key portions of jobs.

LEHIGH PORTLAND CEMENT COMPANY
Allentown, Pa. Chicago, Ill. Spokane, Wash.

LEHIGH EARLY STRENGTH CEMENT

When ONE Truck does the work of FIVE — that's COST CUTTING!

ONE Brooks Load-Lugger with seven buckets replaced five trucks in this quarry . . . reducing operating costs over 25% and increasing production nearly 50%.

Hoisting, Hauling, and Dumping—a fast one man operation from Driver's seat . . . while other buckets are being loaded.

A dirt fill operation . . . and at 20 cents per ton savings over any other method.

Spreading cinders, or other abrasives, on icy streets . . . a similar operation to spreading rock on roads.

The Brooks Load-Lugger is ideal for fast removal of snow. Extra large buckets may be had for this and other light or bulky materials.

ONE Truck with a "LITTER" of Bodies . . . that's the LOAD LUGGER WAY

In the quarry, at the stock pile, in excavating, sewer construction and pipe handling, road construction, W. P. A. Projects, snow removal, and countless other services . . . WHEREVER LOADING IS DONE BY HAND . . . one truck equipped with a Brooks Load-Lugger and 5 to 10 Load Lugger buckets may replace an equal number of trucks, distance of haul considered. Every quarry, every contractor, and every county highway department should have a Load-Lugger outfit. Cut your investment of unnecessary truck equipment . . . stop the heavy loss of time and money in trucks standing idle for loading.

The Load-Lugger may be installed on any truck chassis in a few hours . . . is fool-proof in operation, one man operated from driver's seat . . . has no sheaves, cables, or high pressure hydraulic hose. All sidesway is eliminated by positive guides on buckets . . . no counter weight required, because the entire load is carried directly on truck chassis. The rugged ONE PIECE Load Lugger buckets are practically indestructable and leak proof for any type of service. Here is a piece of equipment that cuts cost where they need cutting most . . . jobs where hand loading is necessary. Tear out the handy memorandum printed below and mail at once . . . you'll be surprised at the reasonable cost of the Brooks Load - Lugger. Demonstrations arranged in most sections.

The Load Lugger Method	The Expensive Method
1 TRUCK	7 TRUCKS
1 DRIVER	7 DRIVERS
1 OPERATING COST	7 OPERATING COSTS
7 LOAD-LUGGER BUCKETS	
50% MORE PRODUCTION OR	STANDING IDLE COSTS
50% LESS LOADING COSTS	50% MORE LOADING COSTS

MAIL THIS MEMO NOW

Brooks Equipment & Mfg. Co., Knoxville, Tenn.

You may furnish us with complete data and illustrated printed matter on the Brooks Load-Lugger.

Firm _____

Address _____

By _____

BROOKS EQUIPMENT & MFG. CO. Knoxville, Tenn.

KOEHRING

— to get rid of the dirt

. . . whether it is a large stripping shovel, or the smallest basement excavator, the Koehring Shovel advantage of *long reach* and *high lift* "gets rid of the dirt".

. . . crowd the dipper above and beyond the end of the boom . . . because of the Koehring positive and independent crowding action. Maximum power is directly available at any point of dipper travel, whether digging or dumping.

KOEHRING COMPANY

CONSTRUCTION EQUIPMENT • MILWAUKEE, WISCONSIN

Job-Test Evidence

Where hauls are figured by the foot!

On the headgate dam, Colorado River, Rohl-Connolly Co.'s ten 18-yd. Cummins-powered Sterlings make seven round trips per hour on a haul of 1,000 feet. Fuel consumption, 1½ gallons of fuel oil per hour.

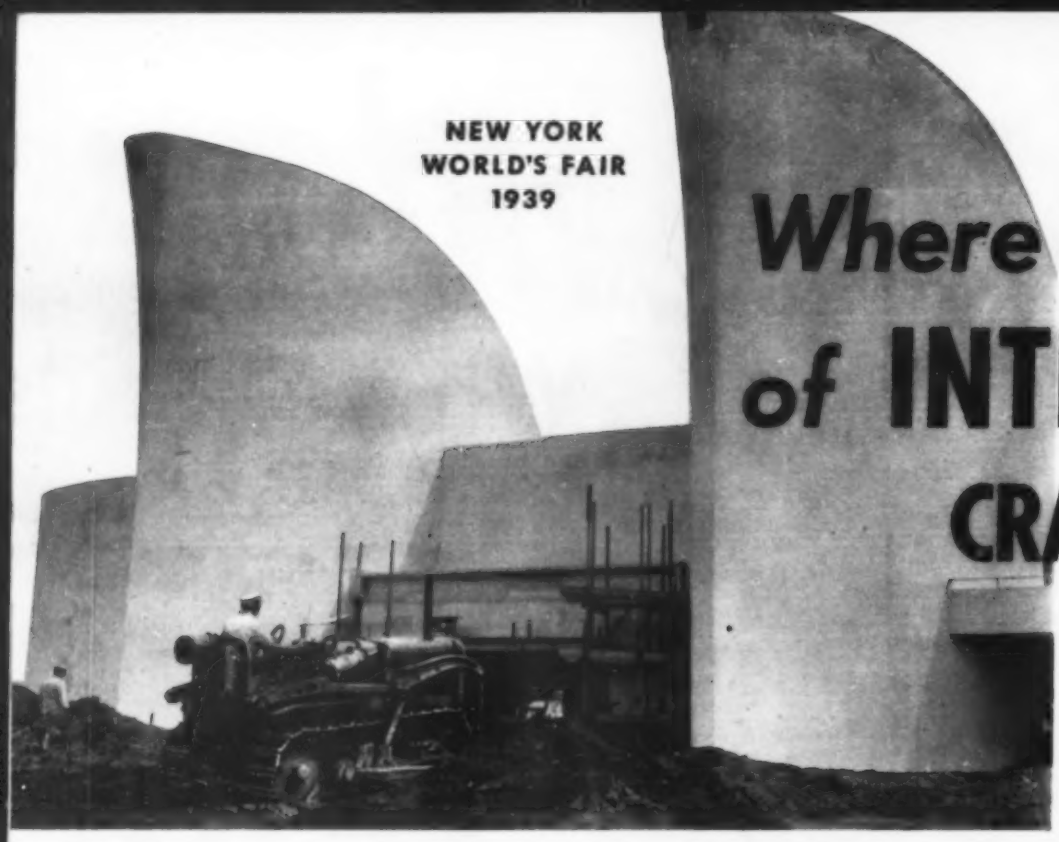
IN SHOVELS . . . contractors specify the Cummins Diesel because it means more power to dig and crowd . . . more passes per hour.

ON COMPRESSORS, PUMPS, and GENERATING SETS . . . contractors prefer Cummins Diesels for their instant starting, smooth, dependable, day-and-night performance . . . their simplicity and ease of service.

Look for the JOB-TEST Evidence before you buy *any* diesel.

CUMMINS ENGINE COMPANY
1714 Wilson Street, Columbus, Indiana

CUMMINS
Dependable
DIESEL



Where a Great Fleet of INTERNATIONAL CRAWLER TRACTORS Transformed a Rubbish Dump

INTERNATIONAL is Still the Favored Power!

TWO YEARS AGO the site of the New York World's Fair was only a nightmare to all except a few far-sighted men. Then came the first great construction feat of the Fair —a relentless night-and-day job *powered by International TracTracTors.*

The Johnson-Necaro Co. shouldered a $2,000,000 contract to handle 7,500,000 yards of tangled refuse in ten months' time. Their success hinged on their fleet of International TracTracTors and bulldozers which handled 90% of the vast yardage of material coming from the shovels and dump wagons. The satisfaction of the veteran contractors had mounted to enthusiasm for the equipment by April 1 of last year when they delivered parks and lagoons where they took over the ancient dump on which Manhattan had heaped its rubbish for 40 years. That heroic ground-work job is long since complete. Now there is activity of endless and exciting variety all over the 1200-acre area. The great Fair rises to glory.

Visit the Fair in this new stage of its progress. You will find the same reliance on International heavy-duty power. Wherever there is heavy concentration of construction International tractors are on the job, powering bulldozers, shovels, and graders. Everywhere it is still a race against time, in close-figured contracts. *Maybe that's why International dominates the heavy-duty power picture out there on Long Island.*

INTERNATIONAL HARVESTER and its full line of International industrial power—wheel and crawler tractors, power units, and motor trucks—are at your service. Call on any dealer or branch.

INTERNATIONAL HARVESTER COMPANY
(INCORPORATED)
180 North Michigan Avenue Chicago, Illinois

At right and above: A few of the many industrial power operations around the grounds—International crawler tractors and international-powered equipment.

Twelve hundred acres like this —7,500,000 yards of swamp and rubbish to handle—a $2,000,000 contract in a race against time. Here are some of the International crawler tractors in the fleet on the site of the New York World's Fair.

INTERNATIONAL INDUSTRIAL POWER

Construction Methods and Equipment

Established in 1919

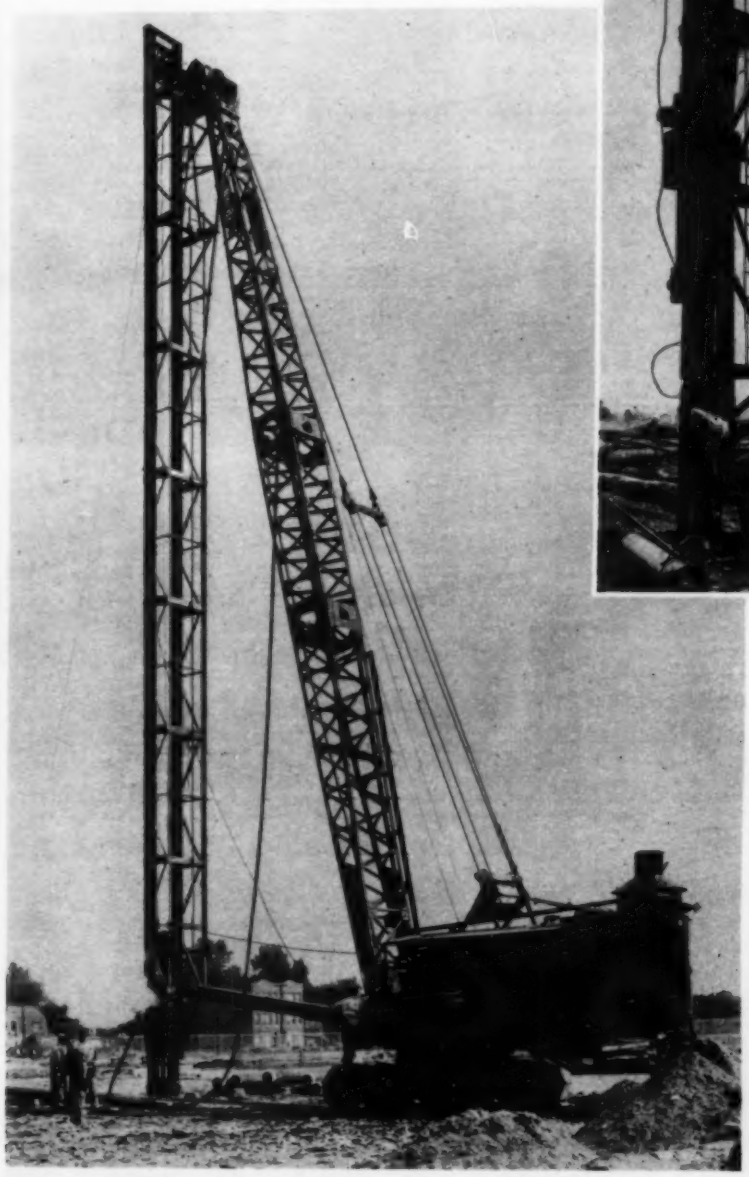
A McGRAW-HILL PUBLICATION

ROBERT K. TOMLIN, Editor

Volume 20 — **December, 1938** — Number 12

Detachable BOILER UNIT

Supplies Steam to Hammer On Pile-Driving Crane

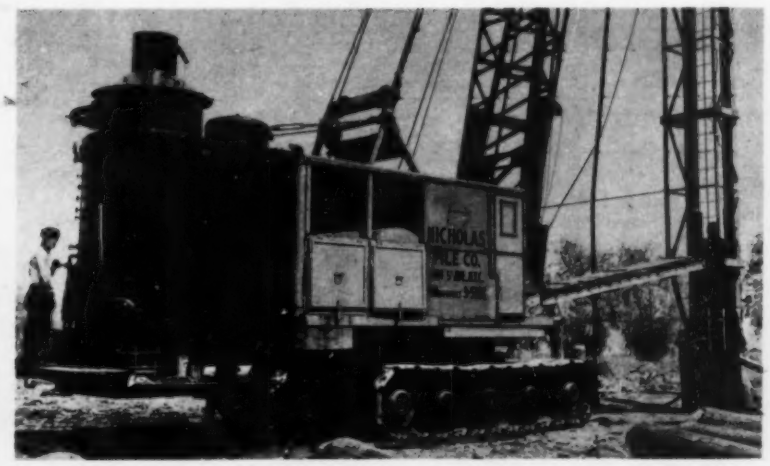


STEAM PLANT carried on detachable platform behind counterweight of diesel crane operates hammer when crane is rigged as piledriver.

HEAVY STEEL LEADS hung from 75-ft. boom guide steam hammer driving foundation piles.

SUPPORTED on a rear-end welded steel platform pinned to the main frame of a Link-Belt K-480 diesel crawler crane belonging to the Nicholas Pile Co., New York City, a 54x102-in. vertical boiler fired with a Best oil burner furnished steam to a Vulcan No. 1 hammer driving timber foundation piles in 80-ft. leads on the crane's 75-ft. boom for the Rumanian building, New York World's Fair. Fuel oil and water tanks were welded, along with the boiler, to the detachable platform, fabricated by the Wagner Whirling Derrick Co., New York City, which also built the steel leads. An additional 25-ft. section has been used to increase the height of the leads to 115 ft. for handling piles 100 ft. long. Batter piles have been driven at a batter of 1 in 3.

Two arms of the detachable platform extend under the crane rotating frame and are fastened by two pins in brackets. The upright welded frame of the platform rests against the crane cab and is connected by two turnbuckles to the cross member of the crane gantry. To detach the steam plant, after the pile leads have been removed, the boom is lowered until a trailer backs under the rear platform. The boom then is raised, lowering the platform on to the trailer, and the turnbuckles are loosened to permit removal of the socket pins and the two pins on the bottom.



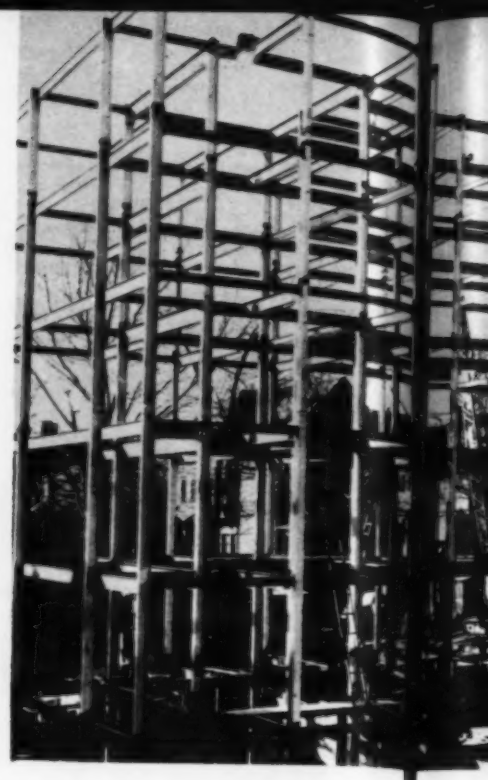
DETACHABLE PLATFORM, pinned to rotating crane frame and attached by turnbuckles to gantry, supports steam boiler, water tank and fuel oil tank welded in place.

This Month's

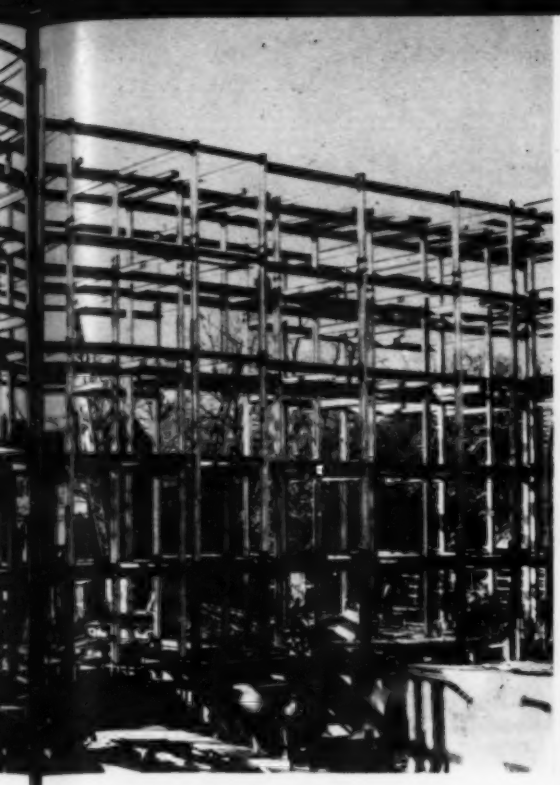
"NEWS REEL"

CABLE SPINNING (below) is ready to start on Bronx-Whitestone bridge, connecting New York City's boroughs of Queens and the Bronx via East River crossing, as catwalks are completed between 380-ft. towers of cellular steel construction and anchorages. Main cable suspension span is 2,300 ft. and side spans 735 ft. Among principal contracts for $18,000,000 structure are: Tower piers and anchorage foundations, Frederick Snare Corp.; tower erection, American Bridge Co.; anchorages, approach piers and ramps, Corbetta Construction Co.; cables and floor, American Bridge Co. Bridge is being built for Triborough Bridge Authority, O. H. Ammann, chief engineer, with Madigan-Hyland as consulting engineers.

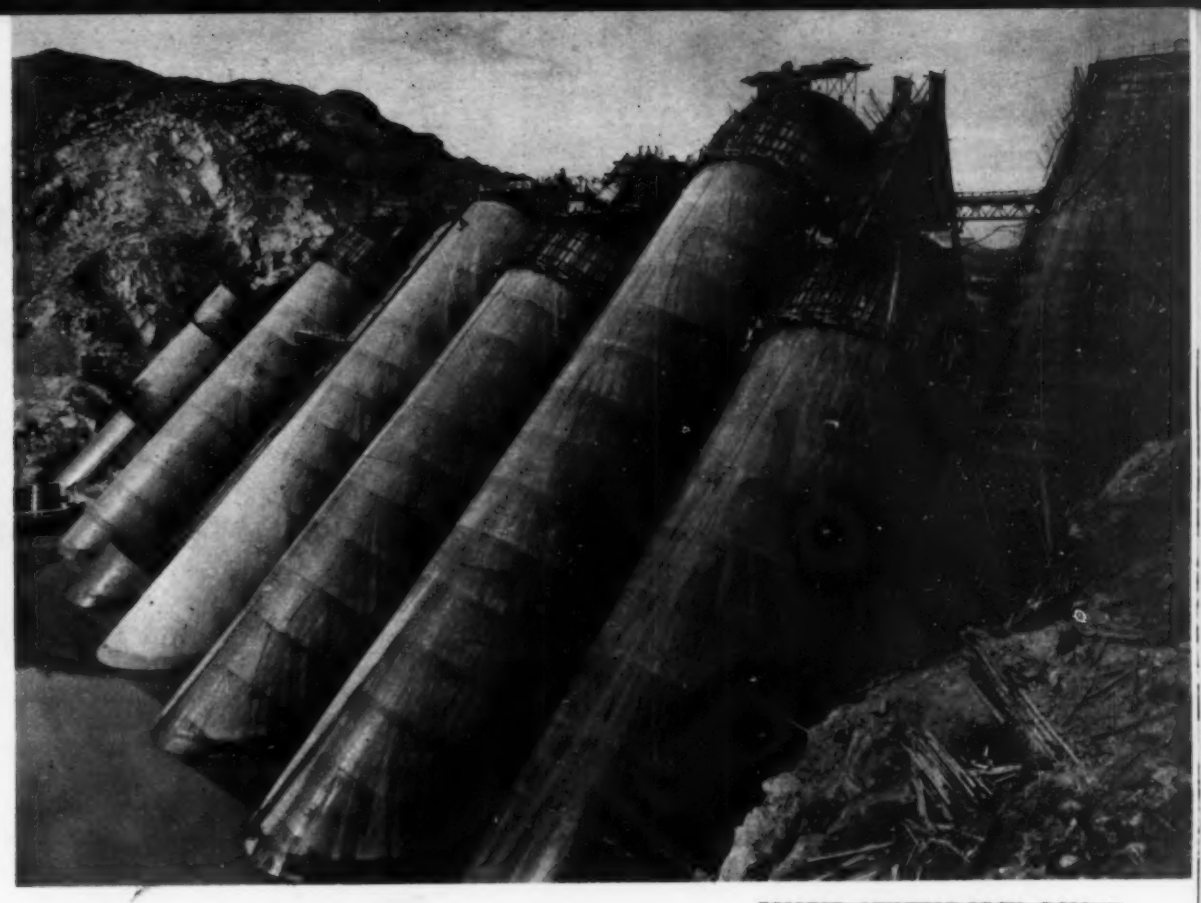
INSPECTION of U. S. Bureau of Reclamation projects requires extended trip by Harold L. Ickes (left) Secretary of the Interior and John C. Page, Commissioner of Reclamation. Itinerary included Imperial dam and All-American canal, Shasta dam and Central Valley project in California and Grand Coulee dam in Washington.



SAN JACINTO TUNNEL (below) of Colorado River aqueduct in Southern California is holed through Nov. 19, marking end of five years' work in completing 13-mi. bore. Construction of San Jacinto tunnel, begun in April, 1933, and carried on under unusual difficulties, has been the "bottleneck" in building the 392-mi. aqueduct for the Metropolitan Water District of Southern California. Holing through of tunnel removes last barrier in line between Colorado River and terminal.



ALL-WELDED STEEL FRAME for State Cancer Hospital in Buffalo, N. Y., is completed in 14 days by Universal Metal Welding Co.; of that city. Five-story structure is 148x105 ft. in plan. Job was done with five J. D. Adams portable welding machines, using 1,150 lb. of welding electrodes. Welding work was directed by J. H. Mason.



TALLEST MULTIPLE-ARCH DAM in world, on Verde River near Phoenix, Ariz., is 80 per cent complete. Bartlett dam, U. S. Bureau of Reclamation concrete structure, built at angle and supported by buttresses, extends to height of 270 ft. It will create reservoir of 200,000-acre-feet capacity to irrigate Salt River reclamation project.

MILL ON A HILL (below) is proper description of Carnegie-Illinois Steel Corp.'s new Irvin Works, to be dedicated by United States Steel Corp. officials on Dec. 15. As noted in construction article appearing elsewhere in this issue, mill stands on man-made bench 227 ft. above Monongahela River, 13 mi. upstream from Pittsburgh. Total area of 653 acres includes 13 mi. of railroad track, river pumping station, reservoir, water treatment plant and sewage disposal plant. Seventeen buildings covering 51½ acres house three principal divisions: an 80-in. continuous hot strip mill rated at 600,000 tons per year, a cold reducing tin plate mill and a cold sheet mill.

POWER SHOVEL KIBITZERS (above, right) are provided with de luxe "ringside" accommodations at the Sidewalk Superintendents' Club, covered observation gallery erected along one side of excavation for new building at Rockefeller Center, New York City, for which foundation is being dug by George J. Atwell Foundation Corp., and superstructure erected by Hegeman-Harris Co. Wall of gallery **(above)** bears Dutch motto for which translation is: "The best pilots stand on the shore."

A REVIEW OF LABOR CONDITIONS IN THE CONSTRUCTION INDUSTRY

By ARTHUR A. JOHNSON

President, The Arthur A. Johnson Corp., Engineers and Contractors, Long Island City, N. Y.

I RECENTLY RECEIVED a letter from the Editor of CONSTRUCTION *Methods and Equipment*, in which, referring to the special 16-pp. section on "Public Relations for Industry" published in the October issue, he stated:

*"The broad purpose *** will be to promote a better understanding between employer and employee and, by so doing, counteract the numerous attacks which are being made on the American system of private enterprise. It lies within the power of management to protect itself against public suspicion, political attack and labor dictation by the natural safeguard of helpful human understanding. The need is urgent. The way is plain. The values involved are so real and so rich that no enterprise can afford, in these times, to pass them by."*

I do not agree with the whole of that statement, insofar as it affects the construction industry. I do not agree that it lies within the power of construction management to protect itself against political attack and labor dictation, for the very simple reason that labor dictation derives its inspiration from political sponsorship. Inasmuch as the construction industry, to a very large extent at the present time, owes its existence to politics in the form of public works of one type or another, does it not follow that political expediency frequently prescribes the enactment of ill-conceived labor legislation which generates labor dictation and thereby erects continuously a barrier between employer and employee?

Unquestionably the greatest obstacle to amicable and cooperative relations between employer and employee today is political expediency. Just as soon as the time was opportune, labor quickly realized that our legislators could only too easily be swayed with a promise of votes. Labor promptly took advantage of this juicy opportunity with the result that, instead of good-naturedly sitting around the table to discuss rates of wages and rules of employment, as used to be the practice, employers now come to the council table to listen to demands, frequently fantastic and oppressive, but usually accompanied with the threat that unless the demands are accepted work will immediately cease, even though in many cases an agreement is in existence providing no stoppage of work until a decision has been determined through the process of arbitration.

Prevailing Rate of Wages Abuse

There is nothing more nonsensical to my mind than the New York State Prevailing Rate of Wage Law, which illustrates what I mean by the statement that politics breeds labor dictation. Under this law the Industrial Commissioner or the fiscal officer is required to make a survey and determine the prevailing rates in the location where construction work is to be performed under a contract. These rates, when so determined, become a provision of that contract. The subterfuge in the law, however, is that it provides that rates so determined are not only the prevailing rates, but are the *minimum* rates which shall be paid. Just as soon as the contract is let, therefore, labor organizations demand and exact that these officially determined wage rates be ignored and that other and higher rates of their own determination be paid.

"Political expediency frequently prescribes the enactment of ill-conceived labor legislation which generates labor dictation and thereby erects continuously a barrier between employer and employee."

"While labor has been given almost unlimited power, it has failed to create a leadership that recognizes that an agreement entered into must be carried out and obeyed by both parties."

Frankly they point out that while the law protects labor against the payment of lower wages, nothing in the law protects the employer from having to meet the higher and frequently exorbitant rates demanded by the labor organizations.

Obviously these one-sided provisions place a dictatorial weapon in the hands of the labor organizers and destroy any possibility of amicable and cooperative relations between the employer and the employee. Efforts have been made to amend this misleading and ambiguous provision of the law, but one might just as well reach for the moon. At the last session of the New York State Legislature a bill was introduced and passed by both branches of the legislature, with only one dissenting vote, providing that when rates of wages are determined under the law by the designated officials having charge thereof, these rates of wages shall be maintained throughout the performance of the contract for which they were determined. It seemed to me that this would be a fair, equitable and just provision in any law, because it not only protects labor against chiselers of labor rates, but it definitely fixes the contractual obligations of the employer as to the rates of wages to be paid throughout the period of the contract. Although this most equitable amendment was passed by both branches of the legislature, it was promptly vetoed without comment or explanation.

Labor Unrest Under Wagner Act

Space does not permit quoting hundreds of similar inequitable provisions which, during recent years, have been enacted into our laws, but we do have sufficient space to refer briefly to the Wagner Labor Relations Act. At the time this law was passed it was frequently pointed out that its provisions would create class distinction and foment labor unrest. Unfortunately these dire predictions have been proved only too true. It is only after the law has been in operation for more than three years, placing the employer in the position of a culprit-defendant before a tribunal that is prosecutor, jury and judge, and stacking the cards in favor of labor organizers whose primary objectives are the perpetuation of their own jobs, that public clamor is about to be effective in a reconsideration of the unjust and prejudiced provisions of this law.

"Just as soon as the contract is let labor organizations demand and exact that officially determined wage rates be ignored and that other and higher rates of their own determination be paid."

The Wagner Act was signed by the President July 5, 1935. Last year it was reported that the total number of strikes in the country for the year was 4,740, or more than double the number for 1935. Seventy per cent of

the strikes in 1937 were caused chiefly by union organization issues, by union rivalry, or sympathetic jurisdictional causes. The journal, "Hide and Leather", recently estimated that 76 per cent of the number of man days of idleness in 1937 resulting from labor disputes was traceable directly to issues raised by union organization methods and efforts.

Wage-Hour Law

Not satisfied with the incalculable harm caused by the Wagner Act, and evidently not disposed to be influenced by the experience gained during the three years this law has been in operation, another law went into effect a few weeks ago with provisions that portend still more compulsion on the employer, and tend to give still more support to the vagaries and fantasies of labor organizers. I refer to the Wage and Hour Law. This law may prove to be almost as great a stimulus to unionization as the Wagner Act has been, for it is apparent, even though the law has been in effect only a few weeks, that further growth of labor unions will be one of its by-products.

The law stipulates that a bona fide labor union, certified by the National Labor Relations Board, can contract to permit its members to work as many as 12 hr. in any one day, or 56 hr. in any one week, providing they do not work more than 2,000 hr. a year. Short of a union contract there is no way for employers to avoid paying time and one-half for hours worked in excess of 44 hr. in any one week, regardless of the average for the year. It seems incredible that any law should provide that such concessions on overtime can only be obtained by placing unions in a position to win compensatory benefits from employers with whom they probably already have contracts.

The simple question I ask is: Why is it necessary that an employer can enjoy this modification in the law only on the condition that a labor union must first give its O.K.? In plain language this means that the law places another weapon in the hands of labor organizers to coerce the employer into further concessions, according to the whims of labor organizers, as the price to be paid for being permitted to carry out one of the law's provisions.

"Unnecessary multiplicity of craft unions breeds provocative and annoying jurisdictional disputes, causing costly stoppage of work."

ARTHUR A. JOHNSON

Political Expediency

All this leads me to the point that I had in mind when I stated that the greatest obstacle to amicable and cooperative relations between the employer and the employee is political expediency. Our legislators must devise a method of perpetuating their incumbency in political office without having to resort to the ruse of catering to the vast army of potential voters who are employed in one way or another by handing them a gift in the form of ill-advised legislation designed to give more and more dictatorial powers to the organizers of the employed. No man of common sense and ordinary decency can endorse such tactics. Until our legislators have become convinced that the problems of labor and industry are so interrelated that they can be settled only by the fullest and frankest cooperation between the parties, with a minimum of political interference, the problem of industrial relations will remain extremely difficult to solve.

Reports of the commission appointed by the President of the United States recently to investigate industrial relations in Europe clearly illustrate that these problems can best be solved with a minimum of political interference, but we in this country are faced with the problem that the employer is first legislated against and then left without redress or recourse. Ill-advised legislation imposes prejudiced conditions on the employer by creating dictatorial methods for labor, encouraged and countenanced by laws influenced by the desire to perpetuate a political party in power.

This condition has brought about unwarranted labor unrest and confusion in New York City and State in the construction industry. Labor unions, by virtue of the power vested in them, have recently decreed, without consultation with the employers, that building construction and heavy engineering construction should be united into one class of construction and performed by crafts of the same type of workmen, all coming under one Building Trades Council. This move is urged in spite of the fact that in the United States for the past century building work has been an entirely distinct operation from heavy engineering construction. This distinction is due to many reasons, chief of which is that the general building contractor does only a small percentage of the building work with his own forces and sublets most of it to a number of specialized contractors who follow one another in sequence, each employing workmen who perform work only of their own particular craft. Heavy engineering construction work does not lend itself to this procedure. Only in rare cases is it possible for one class of work to be finished and another follow in sequence. Generally all workmen on heavy construction are in the direct employ of the contractor and all classes of work are going on at the same time, in one place, and under one direction. The work is mostly of a rough nature, is quite frequently hidden from sight and does not require the skill of an artisan as is the case in most buildings. With the two classes of work differing so greatly, it is reasonable to suppose that the labor classifications should also differ, and that rates of wages should be adjusted according to the degree of skill required in the one type of construction as compared with the other type.

It is obvious that although a workman on heavy construction may be referred to by the same classification and may use tools similar to those employed by a building artisan, it does not follow that he has the same degree of skill or that the same degree of skill is required. It is also obvious that a carpenter sufficiently skilled to install the trim in a building or build a cabinet is a very different kind of a carpenter from

(*Continued on page 55*)

"The Wagner Labor Relations Act places the employer in the position of a culprit-defendant before a tribunal that is prosecutor, jury and judge."

THE AUTHOR

ARTHUR A. JOHNSON, author of the accompanying article, is a well-known figure in the construction industry. He is a former president of the General Contractors Association of New York, and after completing a large-scale grading and earth-handling operation for the site of New York World's Fair, 1939, is at present engaged in building a $5,000,000 section of New York City's Sixth Ave. subway.

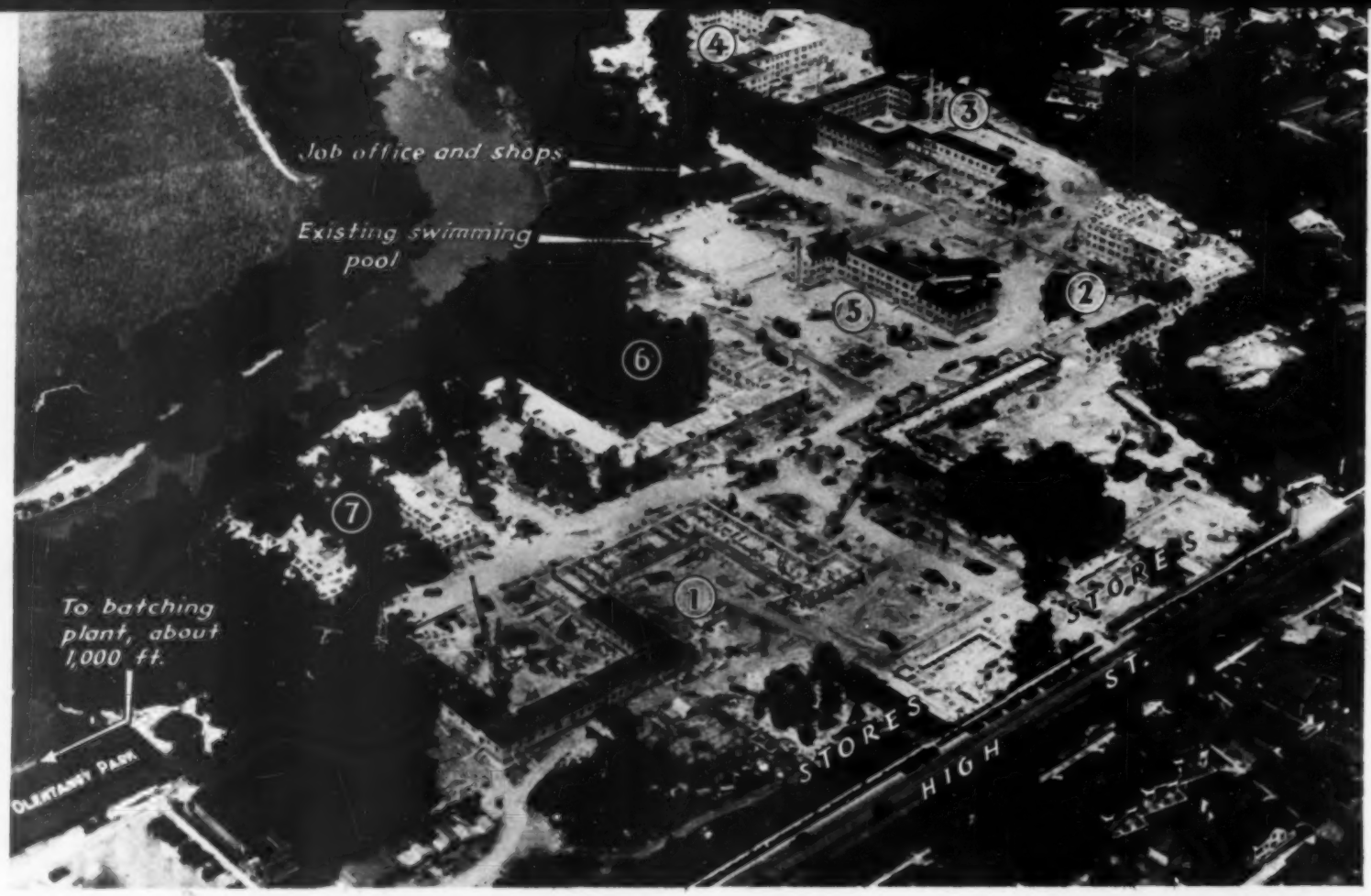


Photo from International Nickel Co., Inc.

ON TRIANGULAR PLOT of 28 acres bordering Olentangy River, owner-builders erect group of seven apartment houses in Project No. 1 of eventual three-stage development planned for entire 66-acre site. Progressive construction keeps 600 to 800 workmen in various trades continuously employed during major phase of fast building schedule.

Transfer Batching of Truck Mixers

Enables Small Fleet to Keep Pace With Rapid Progress on

Private Housing Project

ORGANIZATION AND PROCEDURE are planned by H. M. BOYAJOHN, vice-president and works manager, L. L. Le Veque Co.

DIRECTING OPERATIONS at Olentangy Village are: **(left to right)** M. F. ROSS, chief field engineer; ROY M. SANDS, general superintendent; L. L. LE VEQUE, president, L. L. Le Veque Co; and STEPHEN STEPANIAN, vice-president and general manager, Arrow Sand & Gravel Co.

APPLYING to a private multiple-dwelling housing project in Columbus, Ohio, the same organization and methods which had proved successful on Laurel Homes, $6,000,000 PWA slum-clearance development in Cincinnati, the L. L. Le Veque Company, Columbus, owner and builder, rapidly completed a group of seven houses containing 402 living units of 1,400 rooms, erected as the first step in a three-stage development of a complete apartment-house community known as Olentangy Village. Concrete for the buildings was delivered under contract by the Arrow Sand & Gravel Co., Columbus, in truck mixers batched at a sidehill gravity-flow plant erected on the property.

Working 8 hr. a day and 40 hr. a week, the construction organization placed concrete in foundations and floors at rates of as much as 350 cu.yd. per day and 1,000 cu.yd. per week. By close scheduling of batch trucks delivering weighed aggregates

TRANSFER BATCHING PLANT on site of Olentangy Village, private housing project in Columbus, Ohio, receives truckload of weighed aggregates which are dumped into hopper for charging truck mixer on lower roadway. Sack cement for batch is emptied into box on upper platform of plant. Behind aggregate truck is warehouse for storing cement.

TRUCK-MIXER OPERATOR lowers charging spout into open door of drum before pulling lever and chain to discharge aggregates, cement and water.

to the batching plant at the site, the concrete supplier was able to meet delivery requirements of as much as 56 cu.yd. per hr. with four 3-yd. truck mixers traveling an average distance of ¼ mi. from the plant to the points of concrete placement. A long-boom crane handled all concrete in buckets; — not a yard of concrete was wheeled on the job.

Housing Project — Under its present program, the L. L. Le Veque Co. has practically completed one-third of an eventual development involving 1,200 living units contemplated for the 66-acre site of Olentangy Village on High St., 5 mi. north of downtown Columbus. The plot borders the east side of the Olentangy River, and the builders own sufficient land on the west bank to permit construction of a concrete dam and formation of a small lake on the property. The dam, calling for about 700 cu.yd. of concrete, will be built this year. An amusement park formerly occupied the 66-acre plot, and the builders are reconditioning an existing swimming pool for use by tenants.

In exterior appearance the buildings follow the colonial style of architecture exemplified by Williamsburg, Va. Floor plans and structural details of the apartment houses, paralleling in many respects designs authorized by the PWA Housing Division for use on its projects, are standardized and simplified to obtain economy and construction speed. To provide breaks on roof lines and pleasing variety in appearance, the buildings are varied in height and layout, advantage being taken of sloping land and natural trees. Plans of individual buildings are fitted to the topography; in sidehill locations, first floors in different portions of a building are varied one story height to keep the ground floor close to grade.

Buildings are two and three stories high, with load-bearing brick-and-tile walls and reinforced-concrete beam-and-slab floors supported inside the structure by reinforced-concrete columns. In the stop story, the ceiling framing and interior columns are steel. Ceiling height is 9 ft. in all rooms. Roof frames are of timber, sheathed and covered with Ludovici tile or built-up roofing.

Walls and interior columns rest on spread footings of 2,000-lb. concrete. Foundation walls are 12 in. thick and are constructed of monolithic concrete in excavated portions and of concrete blocks, waterproofed, in unexcavated portions, except the walls of laundries, which are 12-in. brick, waterproofed. Above the foundations, the bearing walls are 12-in. brick and tile up to the top story, where the thickness reduces to 8 in. On the inside, the tile is given two applications of waterproofing and a two-coat plaster surface, which is painted. Floor slabs

CHARGING PLATFORM (below) has two cement boxes and 250-gal. tank for measuring water. End-dump truck discharges batched aggregates into open hopper.

SACK CEMENT (below) delivered to warehouse by truck is stacked on skids for handling by lift trucks.

WAREHOUSE has capacity of 800 bbl. of sack cement stacked on skids in orderly rows for movement into aisle and on to charging platform.

HYDRAULIC-LIFT TRUCK picks up skid loaded with fifteen sacks and moves it to charging platform. Necks of sacks are turned in one direction for ease in handling at cement box.

vary in thickness, 4 to 5½ in., and average 5 in. All structural concrete is designed for 3,000 lb. compressive strength at 28 days. Floor concrete is placed on Masonite forms, which leave a smooth ceiling requiring little finishing before painting.

Each apartment house has its own steam plant, and the largest building has two boiler rooms, making eight in all. Vitrified clay sewer pipes, cast-iron water mains and asbestos-cement underground electrical conduits are installed by the builders.

Quantities — About 10,000 cu.yd. of concrete went into the buildings. In addition, the truck mixers are supplying 3,000 cu.yd. for street and sidewalk paving and 700 cu.yd. for the dam.

Wall construction required about 30,000 pieces of 12-in. concrete block, 2,000,000 face brick, 1,000,000 double common brick for backup, 100,000 8x8x12-in. interlocking backup tile and 100,000 4x5x12-in. tile. Roof frames and partitions took about 800,000 b.-ft. of lumber, and forms required about 470,000 b.-ft. of lumber and 50,000 sq.ft. of Masonite, used repeatedly. Roofs are covered with 980 squares of tile and 433 squares of built-up roofing.

Construction Force—With the single exception of concrete supply, no part of the work was placed under outside contract. All building trades are employed directly by the owner's construction organization. On a busy day just prior to the calling of plasterers and roofers, the job employed 611 men, including 101 plumbers and plumbers' helpers, 89 carpenters, 80 bricklayers, 28 in the electrical gang and 31 on concrete. With plasterers and roofers added, the payroll was expected to go up to 800 names.

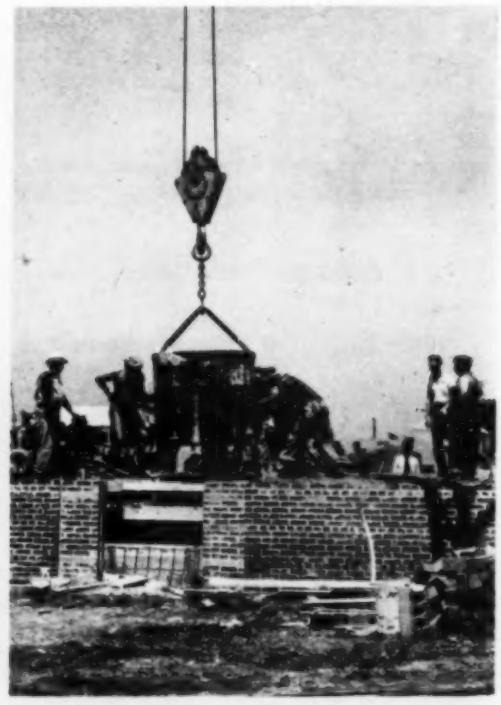
Concrete Crew — For placing concrete, the builders employed nine men, this number including one crane operator, one oiler, one man on the ground to spot buckets, one signal man and one man on a gasoline-powered vibrator. A crew of 22 finishers went over the floors twice.

Batching Plant — By devising a plan for serving the job from a transfer plant at the site, Stephen Stepanian, vice-president and general manager of the Arrow Sand & Gravel Co., obtained definite advantages for his own company and for the builders, supplying all concrete requirements with a small fleet of mixers at an appreciable saving in cost. A steep sidehill location in one corner of the property, out of the way of the builders' operations, provided an ideal site for a gravity-flow batching plant.

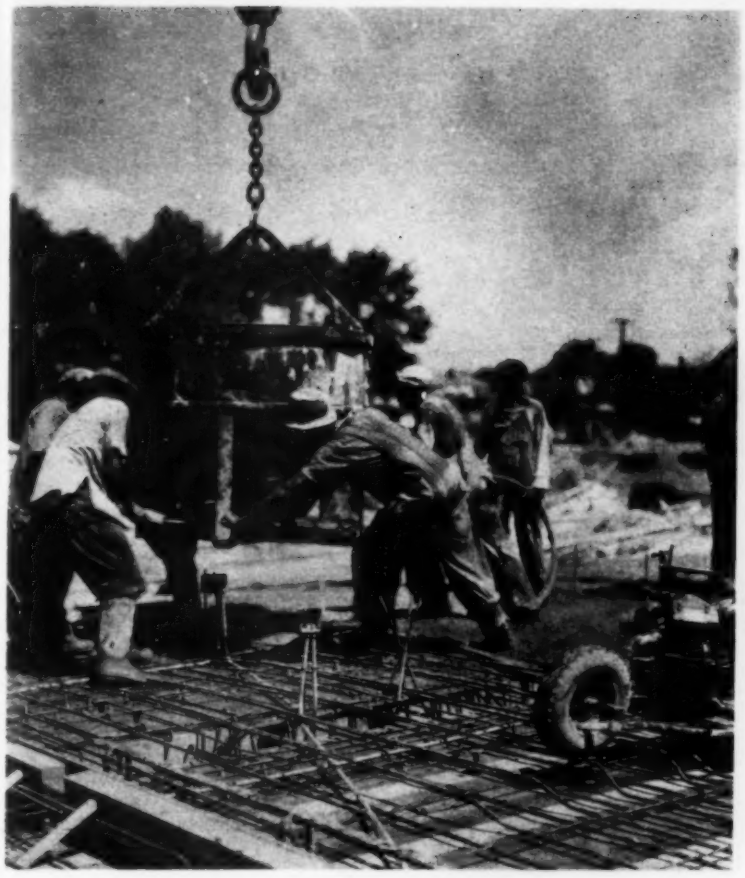
To serve its customers in Columbus, the sand and gravel company operates a fleet of ten 2½-yd. Jaeger mixers on White trucks. By ordinance, a 2½-yd. batch is the

TWO MEN EMPTY sacks into cement box. Second box is provided to avoid delays in cement handling.

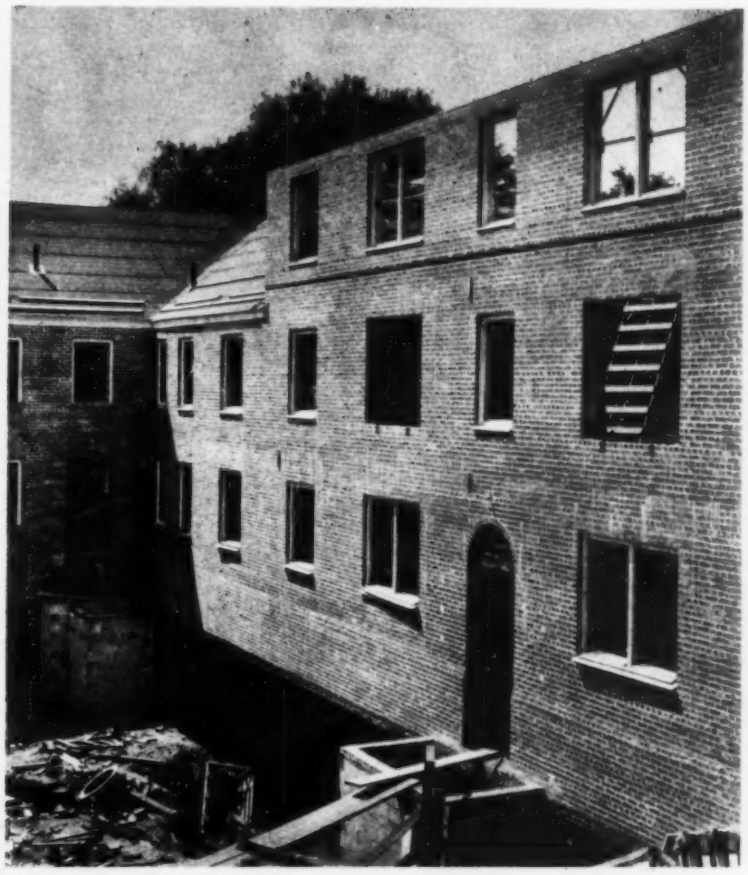
TRUCK MIXER, with rear end raised on timber ramp blocks, discharges concrete into 1-yd. bucket on crane hoist falls.



BUCKET IS SWUNG into position for placing concrete by crawler crane with 75-ft. boom — long enough to reach all parts of buildings without recourse to wheeling.



CONCRETE CREW spots bucket for discharging on to floor forms. Vibrator driven by flexible shaft from portable gasoline engine improves density of beam and ceiling concrete.



PLEASING VARIETY in appearance is achieved by fitting buildings to topography and by breaking roof lines. Foundation walls in excavated portions are monolithic concrete.

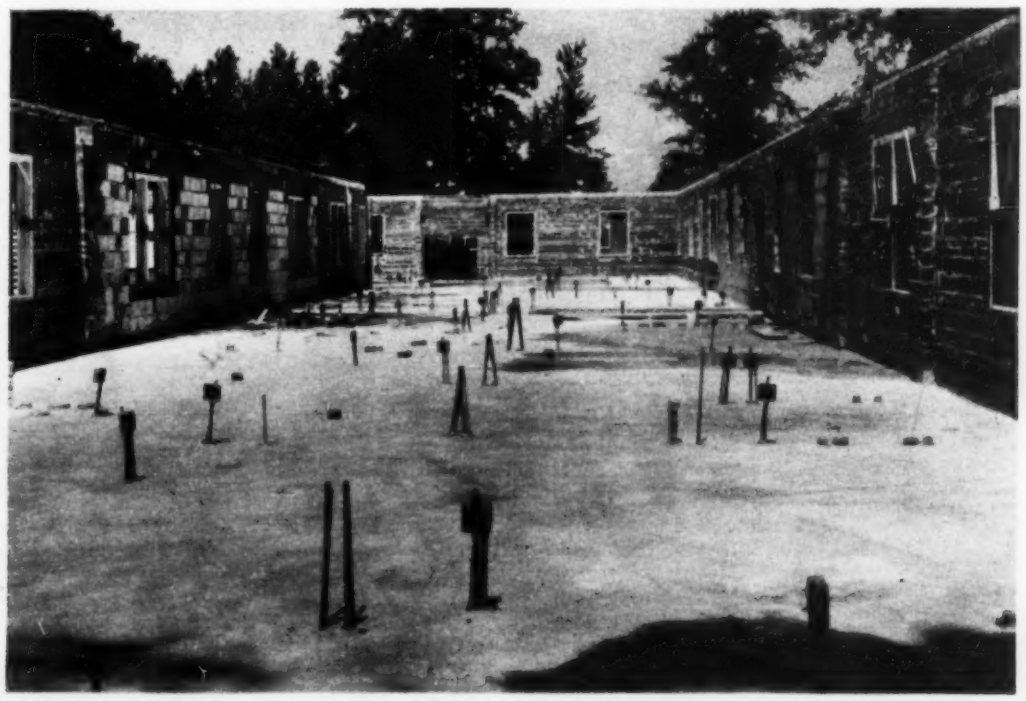
largest permitted on city streets. The company's aggregate plant is 6½ mi. from the housing project. Rather than devote the entire fleet to transporting concrete to the project from this distant source, Mr. Stepanian arranged to load batches into mixers at the site and thus supply the job with four truck-mixer units. As the mixers are operating on private property, they can be charged with 3-yd. batches.

A fleet of 11 to 12 dump trucks, hauling single batches of 5.1 tons each, shuttled between the aggregate plant and the batching plant to meet concreting schedules ranging up to 56 cu.yd. an hour. A hauling route was laid out to avoid main traffic arteries and congested areas. In addition, to avoid the danger of accidents in turning into or out of heavily-traveled High St. at the job, Mr. Stepanian leased driveway rights from an adjacent property owner to permit entering and leaving by way of a side street.

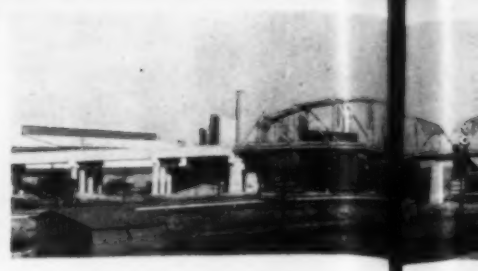
Gravity Charging — A steep sidehill about 20 ft. high permitted design of a gravity-flow plant with cement storage and aggregate dumping facilities on the upper level and a truck-mixer roadway, passing through the timber structure support-

(*Continued on Page 60*)

REINFORCED-CONCRETE FLOOR BEAM (left) frames into load-bearing brick-and-tile wall.



FIRST-STORY WALLS completed to second floor level are ready for erection of beam and slab forms.



Top Surface Heat Protection

Permits Rapid Winter Curing of

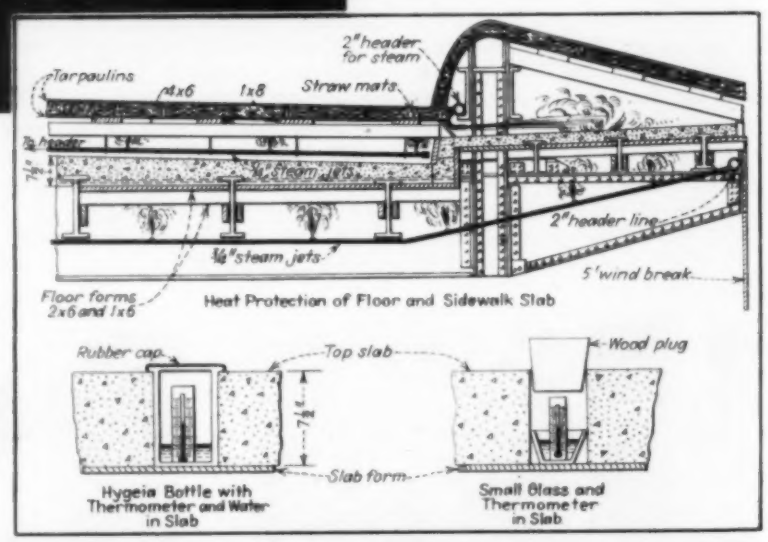
Bridge Deck Concrete

By B. J. FRY
Chief Engineer
E. J. Albrecht Co., Chicago

AND

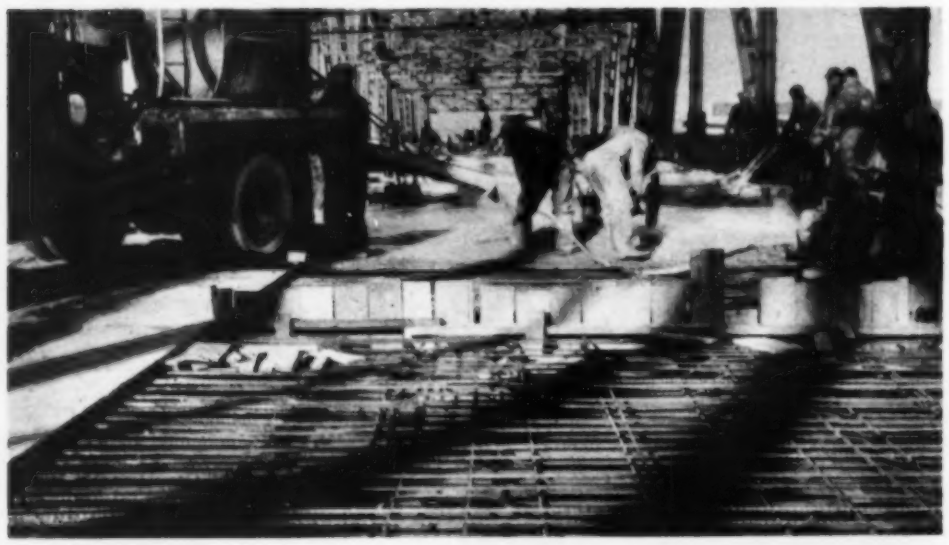
ROBERT DICK
Project Engineer
Indiana State Highway Commission

BRIDGE ROADWAY 40 ft. wide and two 6-ft. sidewalks on four truss spans are concreted in freezing weather by heat-protection methods described in accompanying notes.



TOP COVERING (right) and wind break are only feasible protection for roadway slab and sidewalk concrete heated by steam jets on highway bridge having low clearance over numerous railroad tracks.

LIVE STEAM issuing from jets under heavy covering keeps sidewalk warm and moist during curing period.



TRUCK MIXERS place concrete at 70 to 85 deg. in roadway slab. Ingredients are heated at batching plant.

CROSSING SEVENTY RAILROAD TRACKS in Hammond, Ind., bridge on extension of Indianapolis Blvd. (U.S. 20) includes nine through truss spans ranging in length from 170 ft. to 245 ft. Concrete deck on four of these spans is placed and cured under sub-freezing conditions.

LONGEST BRIDGE in the State of Indiana is the nine-span structure which carries the extension of Indianapolis Boulevard across seventy railroad tracks in Hammond, Ind. Four spans remained to be concreted on Nov. 1, 1936. Sub-freezing temperatures and wind-swept location presented a difficult heat protection problem. Interesting to contractors is the method by which this problem was solved.

E. J. Albrecht Co., Chicago, contractor on this jcb, was notified by the project engineer that, after the first week in November, it would be necessary to heat-protect all superstructure concrete. Night air temperatures were falling below freezing; at that season of the year, they often drop rapidly.

Housing Ruled Out — It was first suggested that the trusses be housed in an inclosure, but this method was found impracticable because of railroad traffic and insufficient clearance; also, insurance was prohibitive because of fire hazard from locomotive blasts. Overhead covering was impractical from the standpoint not only of cost, but also of the impossibility of placing and finishing concrete to the satisfaction of the engineer.

First Heating Plan — The contractor went to work on his heating plans. A system of steam jets was first set up on the underside of the floor system, and a 5-ft. windbreak was hung from the sidewalk brackets. Steam was supplied from a 50-hp. boiler. Concrete, when placed, had an average temperature of 65 deg. After finishing, the concrete was covered with a layer of burlap, 1 ft. of straw and a top cover of tarpaulins. With air temperatures ranging from 28 to 42 deg., thermometers under the covering registered only 40 deg. Also, with nothing but a 5-ft. windbreak on the sides, cross winds literally sucked the steam from the bottom of the floor forms. With no heat on top of the concrete, and heat underneath being wasted by the wind, it was obvious that below-freezing temperatures would expose concrete to danger of freezing.

Added Steam System — To provide improved heat protection, a system of steam jets was installed at the top surface for the next pour, and over these jets was placed a covering of tarpaulins supported on 4x6's and 1x8's. The system of steam jets on the underside of the floor was continued. By maintaining a high temperature on the top surface of the concrete, it was expected that the heat would be conducted through the green concrete slab to the bottom and help protect the bottom surface. Then, if a cross wind made the bottom steam jets ineffective, the top-side heating would assure protection. The additional steam jets made it necessary to add two 35-hp. boilers.

Rapid-Curing Cement — Concrete for all remaining pours was heated at a batching plant, materials including water being heated, and then was transit-mixed to the job and placed at temperatures of 70 to 85 deg. Six thermometers were placed at different panel points throughout the truss at the top surface of the green concrete under the covering of burlap and tarpaulins. Readings, recorded throughout the heating period of 72 hr., showed the following data. Average temperature at top surface of concrete taken from approximately sixty readings was 57 deg., with air temperatures averaging 27 deg. — maximum 42 deg., minimum 19 deg. This

(Continued on page 72)

STEAM JETS on underside of slab are only means of heat-protecting bottom of concrete while curing. Low clearance over railroad tracks makes housing impractical on underside.

TIMBER FRAME to support blanket cover is placed above freshly finished roadway slab. Steam lines are supported from 4x6-in. cross timbers.

HIGH-EARLY-STRENGTH CEMENT makes it possible to end curing ordinarily after 24 hr., permitting workmen to strip covering and move steam lines ahead during afternoon.

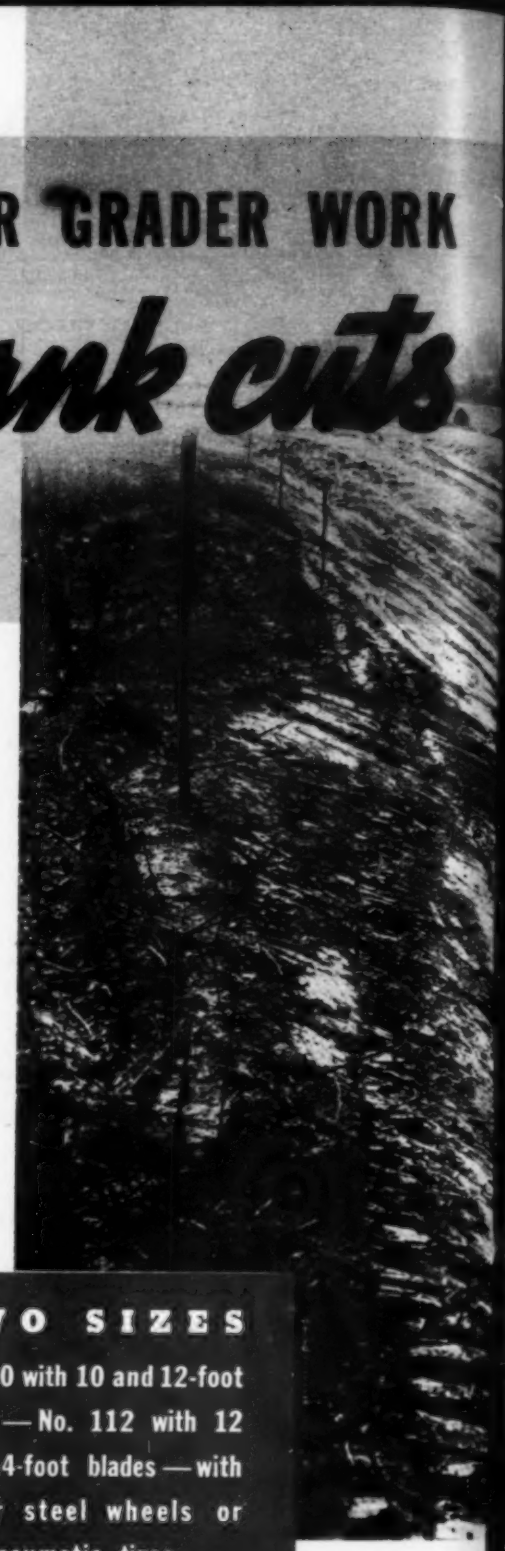
YOU CAN HANDLE ALL YOUR REGULAR GRADER WORK

plus high, hard bank cuts

WITH THE *LEANING FRAME* GRADER

Now you can get up on the banks of deep cuts (see picture at right) and do a real grading job ... by using the Allis-Chalmers Leaning Frame Grader. The leaning frame enables you to shift the grader's center of gravity to fit the slope, even though it be as steep as 1:1. You lean both the frame and the wheels into the work, thus hold the grader to its job ... without slipping ... on slopes where other graders cannot even stick. When cutting back slopes (see picture below) this same leaning frame feature enables you to take deeper, heavier bites ... because you're able to lean the frame weight on the moldboard and so gain extra pressure for cutting through tough materials or shearing off roots. Once the blade is set to the specified cross-section, you obtain uniform slopes simply by keeping a level platform with frame lean control. Thus, whether working on the bank or against it, the Leaning Frame Grader enables you to do a smoother job in fewer rounds and practically eliminates slow, costly hand labor.

See for yourself—on your own job—***what a difference the Leaning Frame makes.*** Ask your Allis-Chalmers dealer to demonstrate.

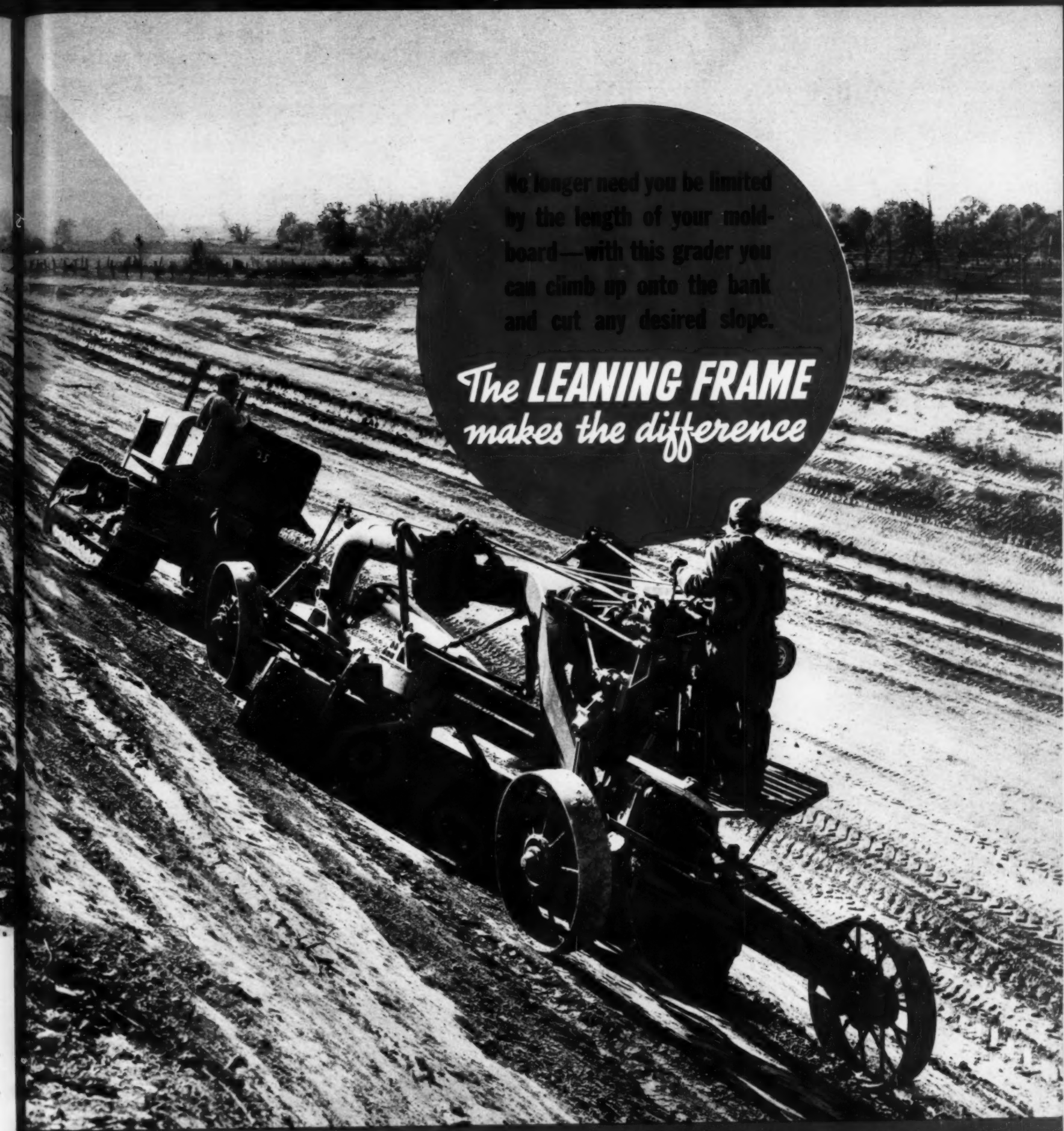


TWO SIZES

No. 110 with 10 and 12-foot blades — No. 112 with 12 and 14-foot blades — with either steel wheels or pneumatic tires.

WORKING ON STEEP SLOPES—Model L tractor and No. 112 Leaning Frame Grader, owned by Eiff Construction Co., finishing 2:1 slope on Illinois State Highway 108. Note the upright position of the frame ... weight is leaned up the bank so there is no tendency to tip or slide to the bottom. Level operating platform enables operator to handle controls in comfort.

CUTTING BACK SLOPES—Model L and No. 112 Leaning Frame Grader, owned by Salisbury Township, Missouri, cutting back slopes for a new road. A-C's Natural Action controls enable the operator to use both frame lean and lift arms simultaneously and thus speed adjustments.


No longer need you be limited by the length of your mold-board—with this grader you can climb up onto the bank and cut any desired slope.
The LEANING FRAME makes the difference

ALLIS-CHALMERS

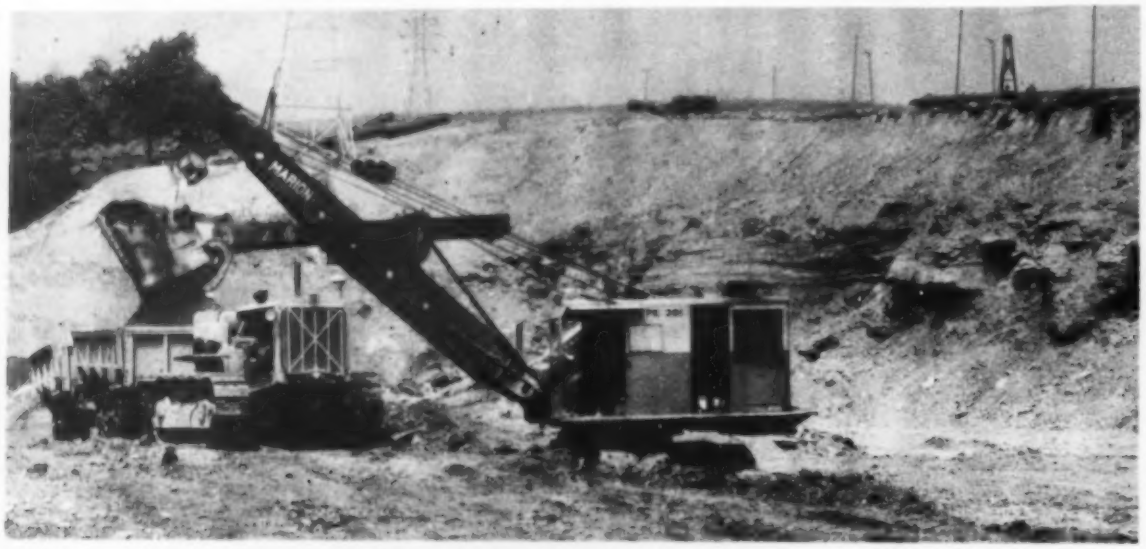
TRACTOR DIVISION—MILWAUKEE, U. S. A.

Gasoline and Demountable Ignition Oil Tractor-type Tractors from 32 to 80 Drawbar H. P. . . Tandem and Single Drive Speed Patrols . . Brush Blade Graders . . Speed Maintainers . . Industrial Wheel Tractors . . Stationary Power Units from 31 to 102 Brake H. P. . . Two, Four and Six-Wheel Scrapers, Bulldozers, Trailbuilders, Loaders, Winches and other Allied Equipment.

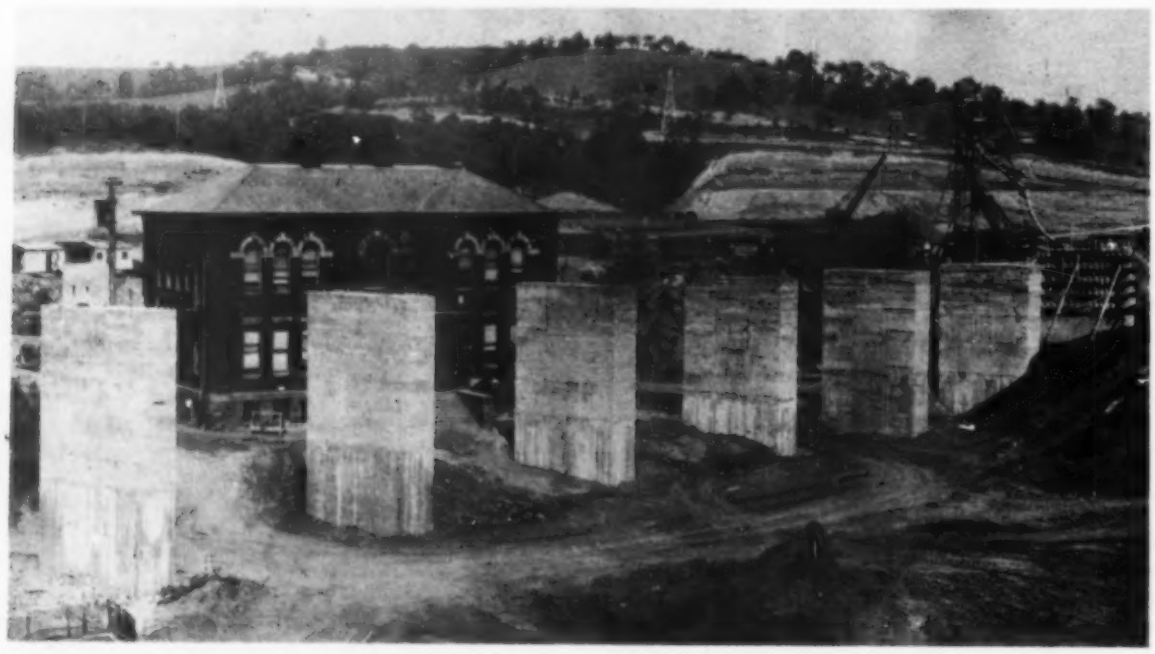
ELEVATING GRADER and power shovel carry on respective stripping and benching operations at site of Irvin Works. Grader loads pneumatic-tired truck-trailer, while in background tandem hookups of tractor-drawn crawler wagons proceed toward rock excavation in left distance. On top of the bank is one of five powerful floodlighting towers for night work.

Fast Footwork by Modern Earth-Movers

Levels Hilltop in Ten Months for Mammoth Strip Mill



SHALE scooped up by 2½-yd. dipper drops into one of tandem side-dump crawler wagons behind diesel tractor.



FORMER SCHOOL BUILDING serves as field office for Carnegie-Illinois engineering force while piers and fill rise around it. Tower attachment at right handles pier concrete from paving mixer.

LEVELING off a hilltop in the short space of 10 months to create a 200-acre site for a steel mill requires a vast array of flexible and fast-moving equipment, as indicated by the accompanying table of construction machines assembled by the Guthrie-Marsch-Peterson Co., contractor, on the site of the Carnegie-Illinois Steel Corp.'s new Irvin Works, which forms the major part of a $60,000,000 construction project. Following the earth-movers, in the tabulation, appears the battery of concrete equipment which put in foundation piers and concrete floors of the huge mill, designed to produce 600,000 tons per year of sheet, strip and light finished steels. The contract of the three allied firms (A. Guthrie & Co., St. Paul; John Marsch, Inc., Chicago; and Edward Peterson Co., Omaha) involved the excavation of more than 4,285,000 cu.yd. of earth and rock and the placement of more than 250,000 cu.yd. of concrete.

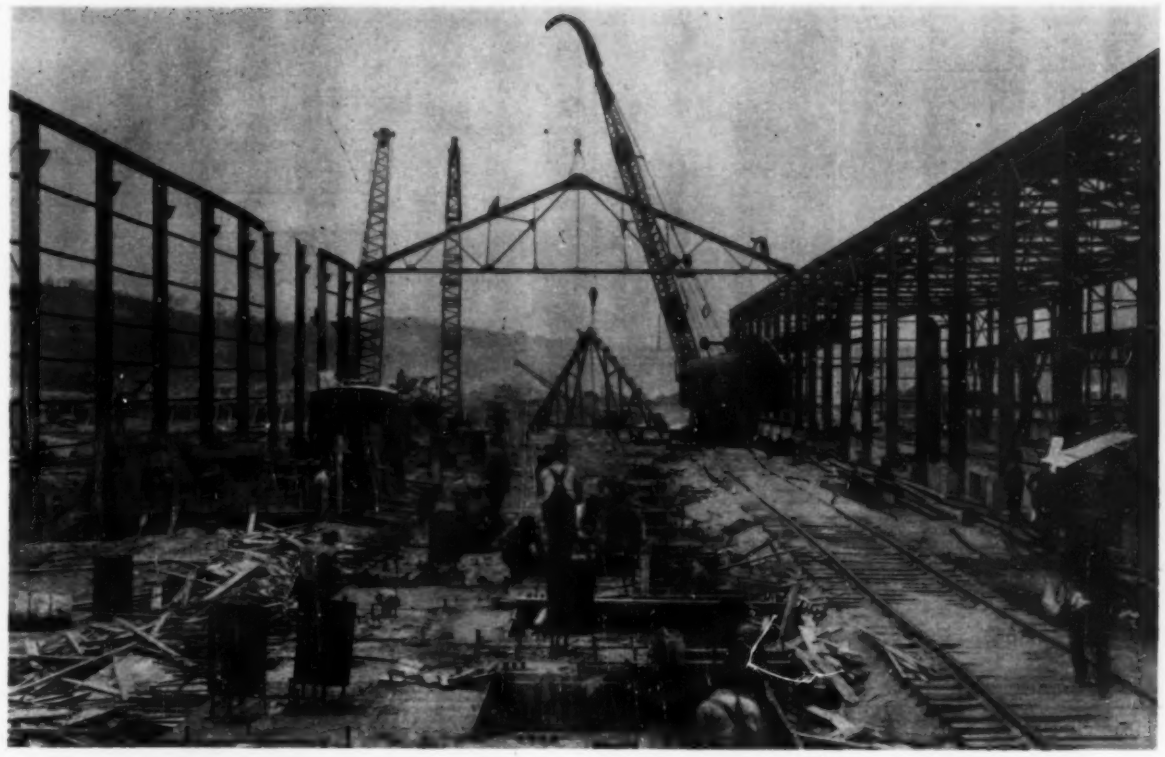
On the foundation piers, as rapidly as they were completed, the American Bridge Co., superstructure contractor, erected the steel frame mill buildings. A considerable portion of the buildings are sheathed with the sandwich type of roofing and siding, insulated with gypsum sheeting between two layers of corrugated sheet steel. About 2,300,000 sq.ft. of roofing and nearly 300,000 sq.ft. of skylights were needed to cover the buildings, which inclose a total of 2,258,800 sq.ft. of floor area. Skeleton frames for the buildings required 28,000 tons of structural steel.

As soon as the buildings were completed, other contractors moved in and set up the rolling mills and equipment for production and finishing of hot strip, cold reduced tin

plate and cold reduced automobile stock in sheets up to 72 in. wide.

In deserting the river valleys and placing their new mill on a hill 200 ft. above the Monongahela, 15 mi. south of Pittsburgh, Carnegie-Illinois engineers broke established precedent and tackled a grading problem which could be solved with economy and dispatch only through the use of modern earth-moving machines. Contract for the grading and foundations was awarded May 17, 1937, and work started May 22. Ten months later first units of the mill were ready to operate. Ample equipment correctly geared to the construction processes and skillful coordination of the manifold activities on the site made this progress record possible.

General Conditions—To grade the 200-acre area for yard and buildings, the contractor made maximum cuts of 137 ft. and fills of 141 ft. Roughly, the operation consisted in gouging a 6,000-ft. north-and-south cut out of the hillside and moving the excavated material eastward to widen the bench by an average 900-ft. breadth of fill. Overall width of the graded area averages about 1,500 ft. Materials range from limestone to soft muck. About 40 per cent of the excavation was rock, encountered in irregular formations in the cuts. The remainder included shale, clay, red dog (incinerated waste of bituminous coal mines and burned underground coal veins), coal, cinders and muck. Material from burning veins was spread in the open for several days to allow it to burn itself out before being placed in fill.



GOOSENECK CRANE of American Bridge Co. erects roof trusses of tin mill building. Early grading provided railroad access to site from nearby Monongahela River line of U. S. Steel Corp.'s Union Railroad.

Earth Moving Progress — Almost 100 pieces of heavy earth-moving equipment furnished the necessary capacity and flexibility to perform the variable and complex operations at the speed required. Operating two 8-hr. shifts in earth during the first weeks on the job, this equipment moved as much as 43,000 cu.yd. per day. When excava-

Earth-Moving and Concreting Equipment

Power Shovels — Five 2½-yd. diesels; two 2½-yd. semi-diesels; one 1½-yd. diesel; one 1½-yd. gasoline; one ¾-yd. gasoline.

Cranes — One 2-yd. diesel; three 1½-yd. diesels; one ⅝-yd. gasoline truck crane; one steam locomotive crane.

Trenching Equipment — Two ladder-type ditchers; one ⅞-yd. diesel pull shovel; one ⅝-yd. diesel combination dragline and pull shovel.

Compressors and Drills — Seven 315-c.f.m. gasoline portables; two 315-c.f.m. diesel portables; ten wagon drills.

Tractors — Nineteen 95-hp. diesels; seven 61-hp. diesels; two 45-hp. diesels; two 65-hp. gasoline; one 60-hp. gasoline.

Tractor Attachments—Six angledozers; two bulldozers.

Elevating Graders — Three 48-in. gasoline power.

Carrier Scrapers — Six 12-yd. Carryalls.

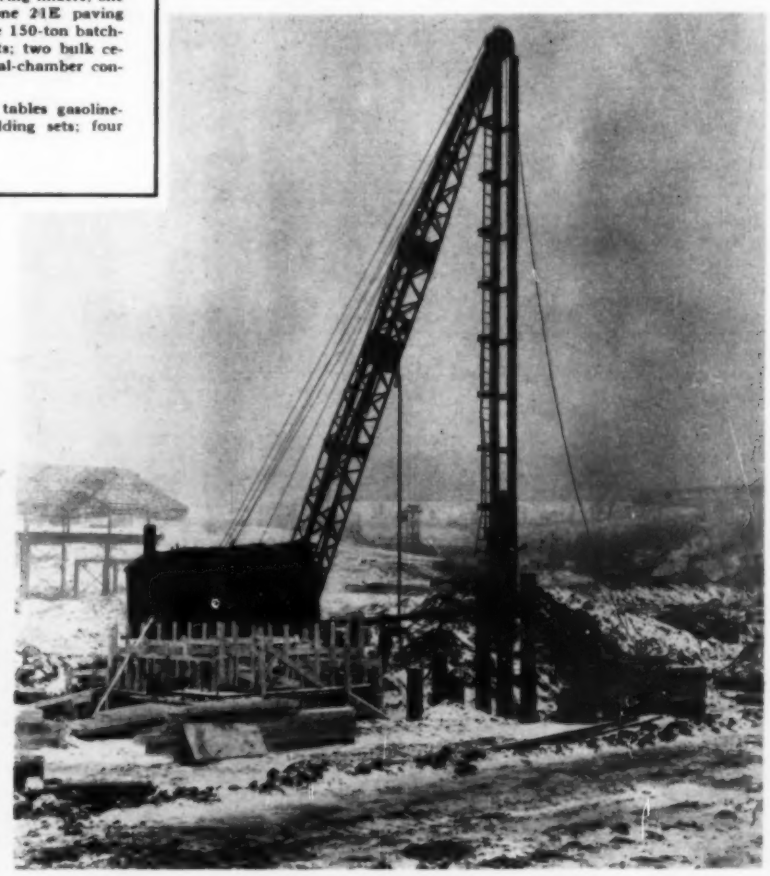
Track Wagons — Seven 14-yd.; seventeen 13-yd.; three 10-yd.

Trucks and Truck-Trailers — Eleven 12-14-yd. rear-dump trucks; eight 12-14-yd. bottom-dump semi-trailers; five pick-up trucks; five stake-body trucks; seventeen 1-yd. batch trucks (rented).

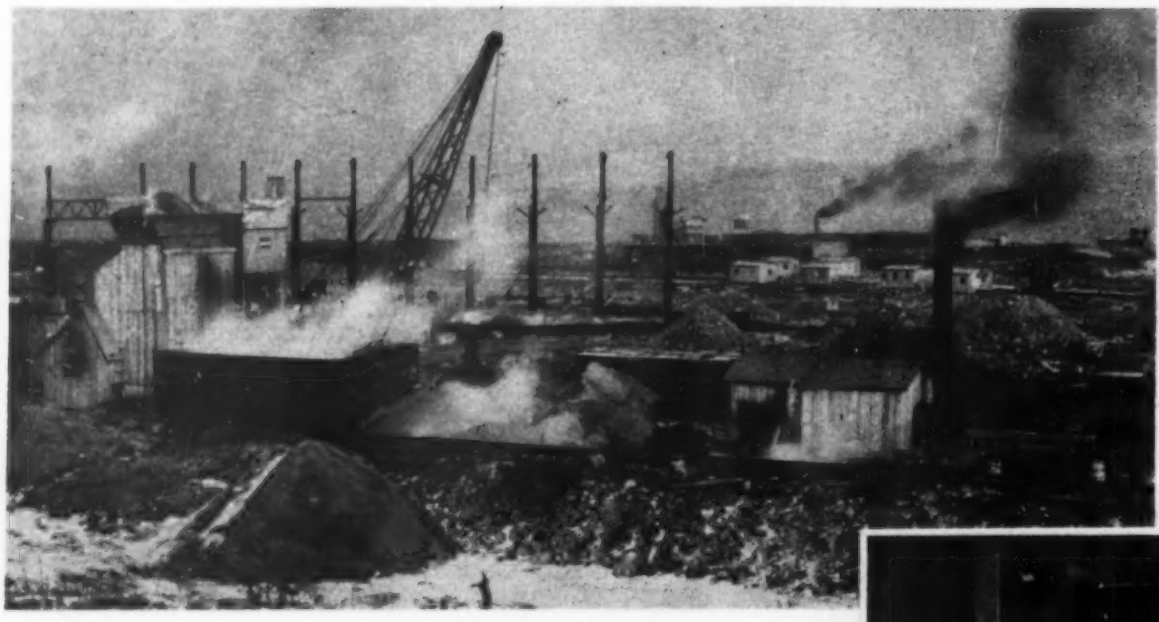
Concreting Equipment — Four 27E paving mixers; one 50-ft. tower attachment for paver; one 21E paving mixer; three 1½-yd. truck mixers; one 150-ton batching plant; two 100-ton batching plants; two bulk cement plants; one 2-yd. mixer; one dual-chamber concrete pump.

Miscellaneous Equipment — Two saw tables gasoline-powered; two 400-amp. portable welding sets; four 4-in. centrifugal pumps.

STEEP DUMPING ANGLE cleans rear-dump truck of shale and clay placed around foundation piers.



IN OLD FILL design calls for 170 piers on 12- and 14-in. CB-section bearing piles totaling about 58,000 lin.ft.



STEAM BOILER heats aggregates and water at batching plant operated in connection with 2-yd. mixer supplying concrete pump. Aggregate cars have been heated in steam shed before delivery to batching plant.

tion had progressed into rock, the equipment worked three shifts and moved a maximum of 40,000 yd. a day.

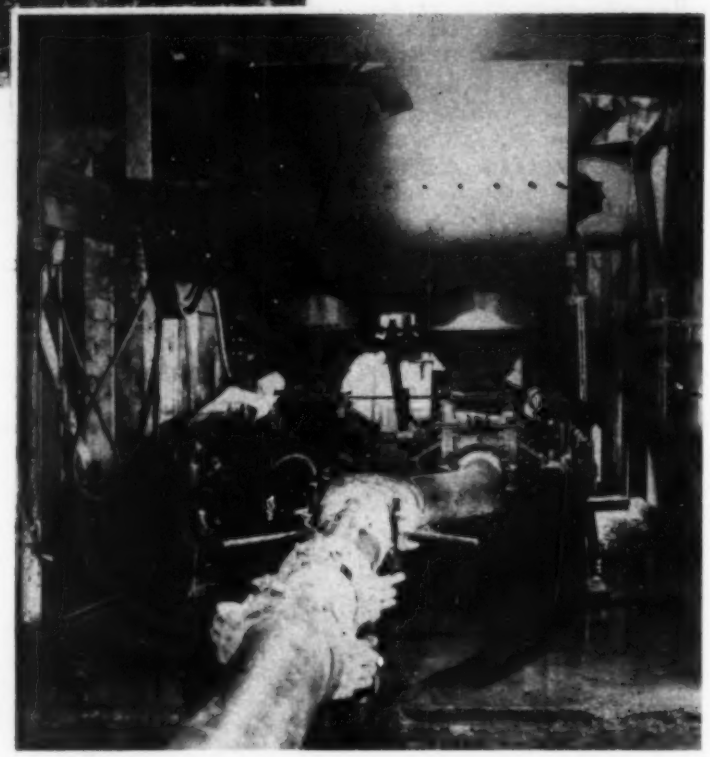
Excavation Procedure — Three 48-in. elevating graders stripped topsoil and removed clay and shoft shale (loosened by scarifiers when necessary) in areas where large level tracts could be worked. The graders loaded the material into the low, wide bodies of truck-trailer units, which hauled average distances of ¼ to ½ mi. to bottom-dump their loads in building areas, where this class of fill was most desired.

Six pneumatic-tired 12-yd. carrier scrapers, working in single or tandem hookup behind powerful tractors, removed most of the overburden and did some excavating of shoft shale, hauling their loads average distances of 500 to 1,500 ft. These units also had the job of cleaning up the excavated benches, keeping the floors clear of loose material.

In general, excavation was carried down in broad benches from 5 to 20 ft. high, depending upon the class of material. Seven 2½-yd. shovels and three smaller shovels loaded rock, shale and other materials into tractor-drawn crawler wagons, end-dump trucks, and into any truck-trailers that were not working with the elevating graders. Crawler wagons traveled various one-way distances from a few hundred feet to ⅜ or ½ mile. They frequently were hooked two or three in tandem behind a tractor. When feasible, the larger flaring-side bodies were used for rock and the smaller, straight-side bodies for shale and red dog.

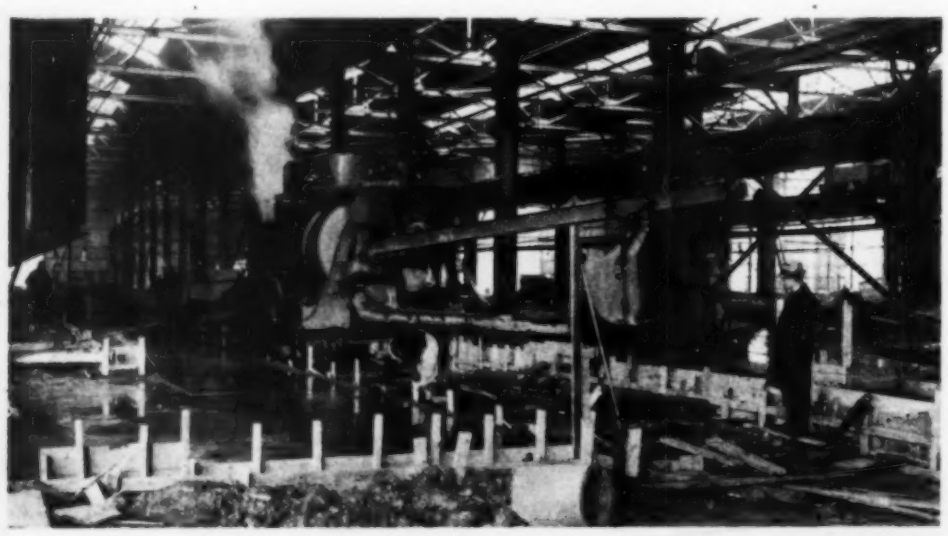
Rock Blasting—Drilling procedure varied according to the material. Holes were spaced fairly close and drilled 6 to 20 ft. deep, using detachable bits. The drillers put down about 12,000 lin.ft. of holes per day. In shale and soft rock it was common practice to spring the holes with dynamite and load with black powder. In hard rock the usual pro-

(Continued on page 65)



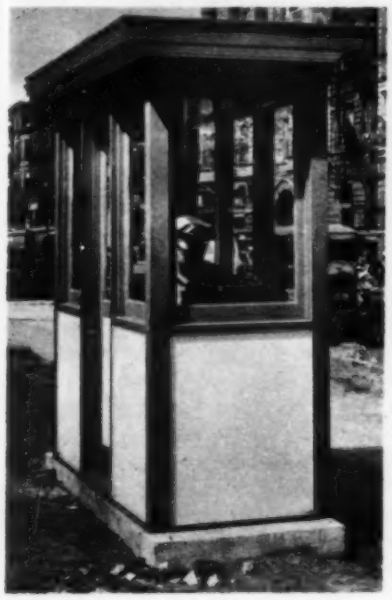
DOUBLE-CHAMBERED CONCRETE PUMP takes mixed batches from 2-yd. mixer and forces concrete through long pipe lines to foundation piers and other structures.

DIRECTING OPERATIONS (left), for Guthrie-Marsch-Peterson Co., contractor: EDWARD PETERSON (left), president, Edward Peterson Co., and ROBERT M. KNOX, vice president, A. Guthrie & Co. Missing from picture is NICHOLAS MARSCH, of John Marsch, Inc.



PAVING MIXER using hot water for mixing places concrete floor slab in mill building during winter.

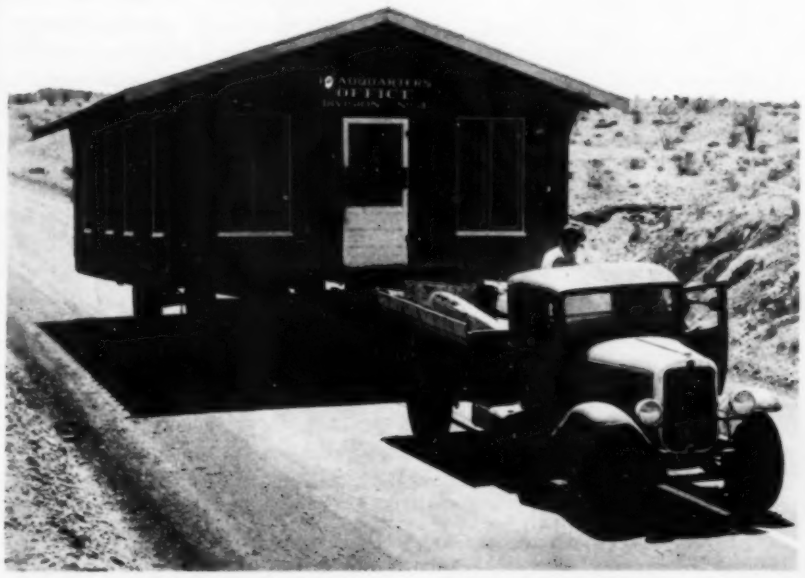
OPEN FOR BUSINESS, diminutive office building **(below)** of G. Brown, manager of Socony-Vacuum Oil Co.'s parking lot on East Walton Place, Chicago, is complete and modern in every detail, having electric lights, electric-heating system and Celotex cane fiber board insulation in walls and ceiling.



WHITE-HOT BRANDING IRON (above), instead of conventional ribbon-snipping scissors, is applied by Governor Frank F. Merriam, of California, to burn rawhide riata barrier held across highway by two Livermore cowgirls during ceremony of opening to traffic new Altamont Pass realignment, known locally as Livermore Boulevard, eliminating 8½ mi. of old narrow, winding grades in Alameda County.

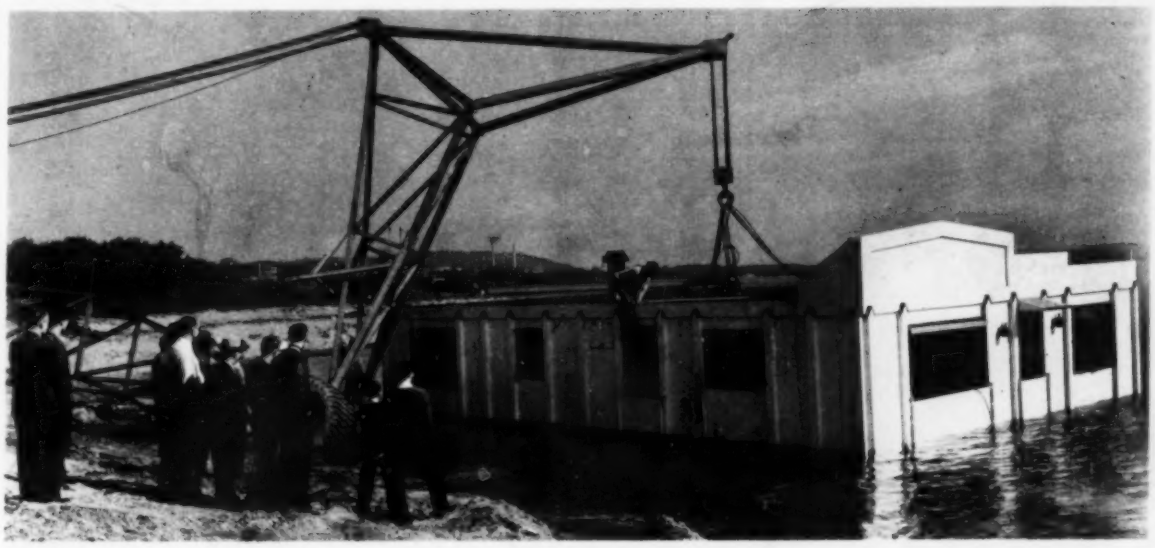
JOB ODDITIES

A MONTHLY PAGE OF *Unusual Features of Construction*



ITS JOB COMPLETED, construction veteran retires from active service as headquarters office **(left).** Division 4, Metropolitan Water District of Southern California, on Colorado River aqueduct, and moves to quiet location in Coachella Valley to end its days as a restaurant. In its bustling youth, building played an active part in construction of 33 mi. of Coachella tunnels, starting life at Pushawalla, moving later to Berdoo Camp and, finally, staking its claim "up on the hill" in vicinity of Mecca Pass tunnels.

CONCRETE BY BARREL is produced by this improvised one-man-power mixer, in regular use for finishing work on a large contract in Province of Quebec, Canada. Unit consists of barrel turned by crank handle made up of few pieces of 1-in. pipe. — Photo from **ROBERT F. LEGGET,** Toronto, Ontario, Canada.



FLOATING ON ITS OWN BOTTOM (left), all-welded steel house completed ready for occupancy in shops of R. G. Le Tourneau, Inc., Peoria, Ill., is lowered into Illinois River by tractor crane ready to be towed 1½ mi. toward final location on other side of stream. Doors sealed to height of 28 in. by steel plates and rubber gaskets keep river out of 32x44-ft., 41-ton house drawing about 1 ft. of water. Five-room dwelling, with built-in garage, is fully equipped with furnace, stoker, cooling system, laundry and plumbing.

DESIGN AND CHARACTERISTICS

Of Automotive Haulage Unit

DETERMINE VEHICLE'S AVERAGE SPEED

By HORACE K. CHURCH

Engineer, Euclid Road Machinery Co., Cleveland, Ohio.

● **This article is the fourth unit in a group of five articles on automotive haulage. Each article tells its own story and can be used independently of the other four. Considered as a group, the five articles furnish a complete analysis, based on 75 detailed field studies, of the factors controlling production and costs of hauling with rubber-tired automotive units on construction jobs and in open-pit mines and quarries.**

Previous articles appeared in June, pp. 42-43; July, pp. 36-38; and September, pp. 56-59 and 62.

AVERAGE SPEED, which controls hauling time, has little or no relation to the speed of an automotive hauling unit as generally set forth in the specifications. Instead, average speed is related to the power, gear selectivity, traction and flotation of the hauling unit.

Power — Discussion of power is confined to engines of 500- to 750-cu.in. displacement range. It is necessary to emphasize that nominal engine horsepower ratings, as given by the hauling unit manufacturer, require careful interpretation by the estimator and the prospective buyer. A statement of nominal horsepower is incomplete without statements of governed engine speed for the given horsepower and engine displacement.

Even if all these data are detailed in the specifications, it is probable that horsepower, torque, and fuel consumption are based on the so-called "Standard Net Stripped Engine" curves. In other words, these three characteristics are for the engine without essential auxiliary equipment such as water pump, fan, generator, air cleaner, governor, air compressor, and muffler and tail pipe. Accordingly, standard-net-stripped-engine horsepower is not the clutch horsepower of the engine when it is completely installed in the chassis and ready for service. The power loss due to auxiliary equipment may be about 15 per cent of rated horsepower.

If the estimating engineer desires to know actual horsepower available for moving the gross load, it is necessary to make further reductions for all internal gear and rolling friction from clutch to driving wheel-ground contact. It is generally agreed that about 20 per cent represents this power loss.

Furthermore, if the unit is intended for high altitude work, the horsepower as given by the standard-net-stripped-engine curve must be reduced. Volumetric suction efficiency data indicate that power losses average 3 per cent for every 1,000 ft. of altitude above sea level, the datum plane for the curves. Some of the percentage loss can be reduced by the use of high compression heads for the engines, but more satisfactory results are obtained when a larger engine is selected with sufficient displacement to compensate for the rarified air at high altitudes.

To illustrate the ambiguity of nominal horsepower rating and the difference between this rating and the actual available horsepower for moving the gross load, let us take the example of two manufacturers using the engine for which an accompanying table gives performance characteristics. One manufacturer, using this engine, specifies that the engine is 110-hp. The second manufacturer,

UNUSUAL POWER HAUL by diesel-engined hauling unit takes 30-ton gross load up 10 per cent grade at average speed of 5 m.p.h.

Standard Net Stripped Engine Performance Characteristics For Six-Cylinder Four-Cycle Gasoline Engine, 4⅝x5⅛ in., 517-cu.in. Displacement

R.P.M. of Engine	*Horsepower*	*Torque, ft.-lb.*	*Fuel Consumption, lb. per hp.-hr.*
400	25	320	0.69
500	31	325	0.68
600	37	330	0.64
700	42	335	0.62
800	48	335	0.60
900	54	333	0.59
1,000	60	330	0.58
1,100	66	326	0.57
1,200	72	322	0.57
1,300	78	318	0.57
1,400	83	314	0.57
1,500	88	310	0.57
1,600	93	305	0.58
1,700	97	298	0.59
1,800	100	290	0.60
1,900	103	283	0.61
2,000	106	275	0.63
2,100	108	267	0.65
2,200	109	259	0.67
2,300	110	250	0.69
2,400	109	240	0.71

using the same engine, specifies that the engine is 100-hp. at 1,800 r.p.m. governed engine speed.

In explanation of the two different ratings, it may be said that the first manufacturer, striving to show high "paper" horsepower, picked the value from the absolute top of the horsepower curve, where torque begins to drop off abruptly and where fuel consumption is high, and governed the engine at 2,300 r.p.m. The second manufacturer, realizing the adverse effect of too high governed engine speed upon engine maintenance and realizing, too, that the 10 per cent power advantage is fancy rather than fact, governed the same engine at 1,800 r.p.m. and called it a 100-hp. engine.

As shown in the table, torque and fuel consumption at 1,800 r.p.m. are 290 ft.-lb. and 0.60 lb. per horsepower-hour, whereas the values at 2,300 r.p.m. are 250 ft.-lb. and 0.69 lb. per horsepower-hour.

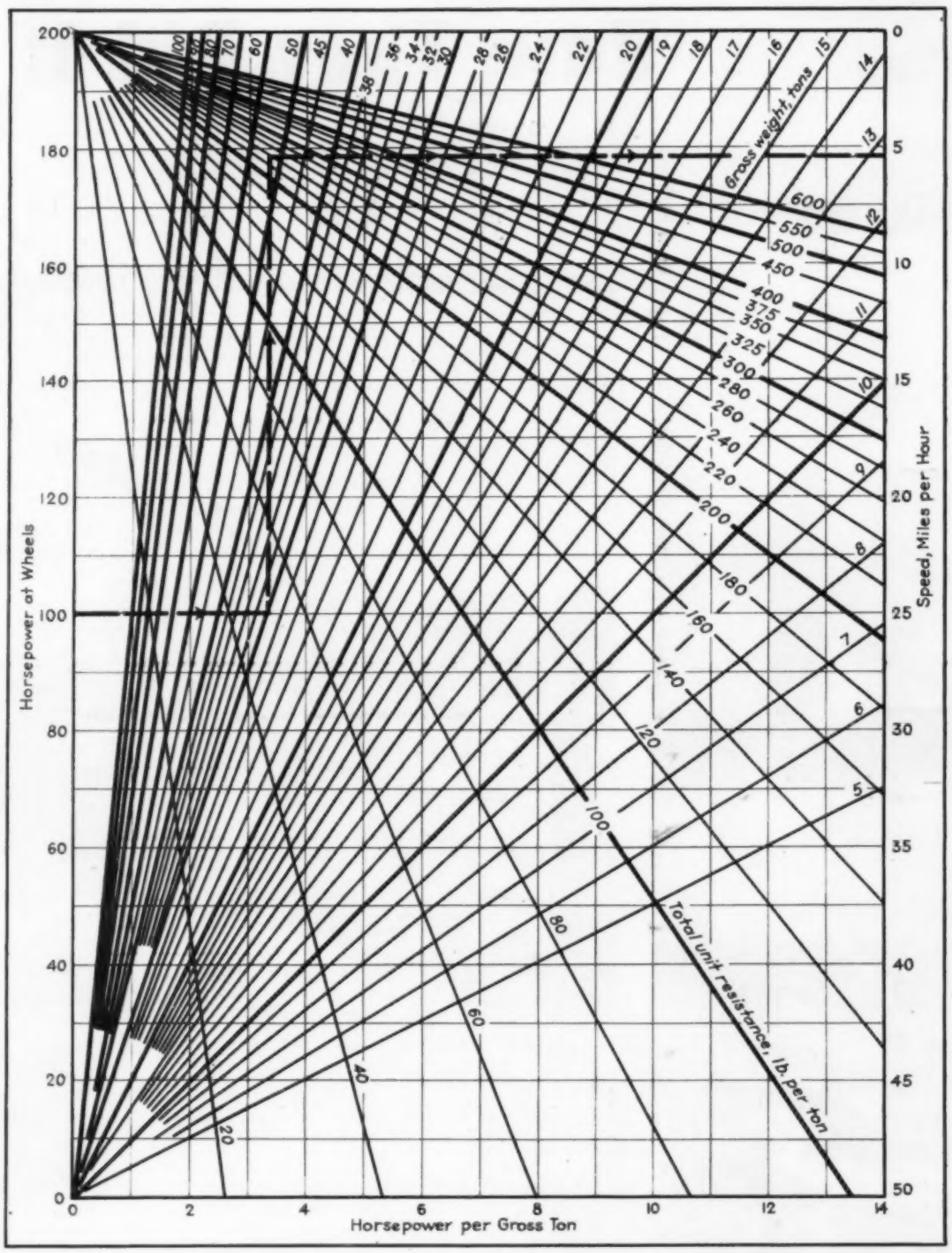
If the 100-hp. engine is to be used on a dam project in Taylor Park, Colo., the estimator must recognize a sharp reduction in actual horsepower available for driving the units.

(1) Taylor Park is at altitude 9,000 ft. above sea level, and the 100-hp. net-stripped-engine becomes 73-hp.

(2) Necessary engine accessories may account for 15 per cent of the 73 hp., and thus clutch horsepower becomes 66 hp.

(3) Internal gear and rolling friction may account for 20 per cent of the 66 hp., and accordingly actual available horsepower becomes 53.

TREAD DESIGNS impressed in gumbo soil on Mississippi River levee-building contract indicate gripping ability of tires in slippery, moist material.



PERFORMANCE CHART connecting horsepower at wheels, gross load, total unit resistance and travel speed provides graphical method of solving for travel speed when three other factors are known, as explained in last two paragraphs of accompanying text.

In making this analysis we have seen the reasonably conservative manufacturer's 100-hp. rating shrink to 53 hp. A study of the Taylor Park dam project, where units weighing 10.5 tons empty returned up a 15 per cent grade, disclosed a travel speed of 5 m.p.h. with the aforementioned 100-hp. engine. With an assumed rolling resistance of 50 lb. per ton, this speed requires 49 hp. actually available at driving wheel-ground point — a fair check on the estimated figure of 53 hp.

A survey of many haulages leads the writer to believe that the user should think in terms of engine displacement per ton of gross load when considering engine selection. This ratio of displacement to gross load is simply another way of stating a ratio between horsepower at reasonable governed speed and total load.

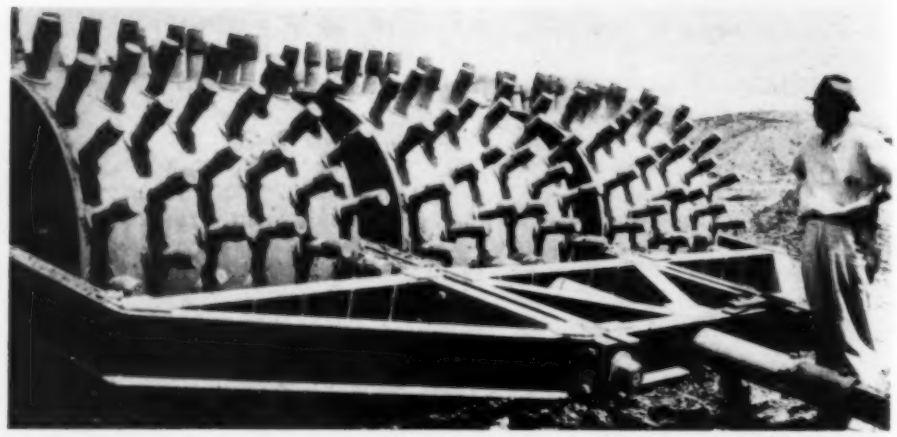
For hauling units with gross loads between 20 and 35 tons, engine displacements should range between 500 and 700 cu.in., giving a factor of 20 cu.in. per ton. Such a displacement-load factor usually guarantees good performance and low maintenance at engine speeds between 1,800 and 2,000 r.p.m.

Gear Selectivity — Gear selectivity has a direct bearing on the average travel speed of the unit. As previously stressed in the discussion of average speeds (CONSTRUCTION *Methods and Equipment*, September, 1938, pp. 56-59 and 62), hauling and returning speeds are low, averaging perhaps 9 m.p.h. with maximum of 18 m.p.h. in average construction work. Granted these facts, it is useless to build a top speed greater than 20 or 25 m.p.h. into a hauling unit designed for average work. Special long-haul work over good haul roads is another consideration and calls for appropriate available travel speeds.

Usually transmissions have five

(*Continued on page 57*)

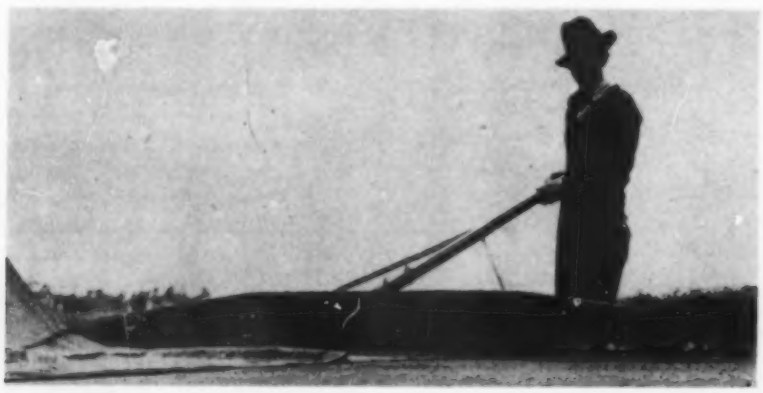
TRUCK-MOUNTED EARTH DRILL supported on scaffold bores 120 holes 2 ft. in diameter and 20 ft. deep for cast-in-place piles along two sides of large sewer on job recently completed for Santa Fe Railroad by Campbell-Lowrie-Lautermilch Corp., contractor, Chicago. Buda-Hubron drill excavates 120 holes in 5 days, working three shifts per day and drilling maximum of 42 holes in 24 hr. To sheet holes against sand encountered at depth of about 6 ft., contractor before drilling drives steel cylinders of slightly greater than 2-ft. diameter to clay and leaves steel form in position until concrete is placed.



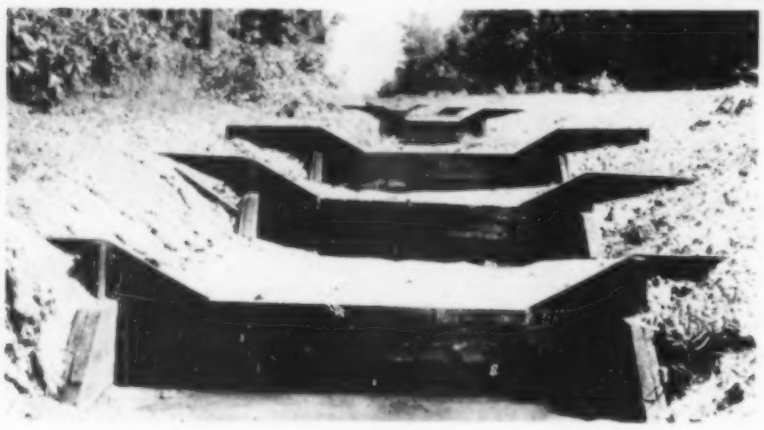
NEW-TYPE SHEEPSFOOT ROLLER built by Emsco Derrick & Equipment Co., Los Angeles, to design of U. S. Bureau of Reclamation for use on Caballo dam, New Mexico, has removable circular feet which can be replaced in field. Three rollers incorporated in unit are mounted on self-aligning shafts running in heavy-duty roller bearings.

How They Did It

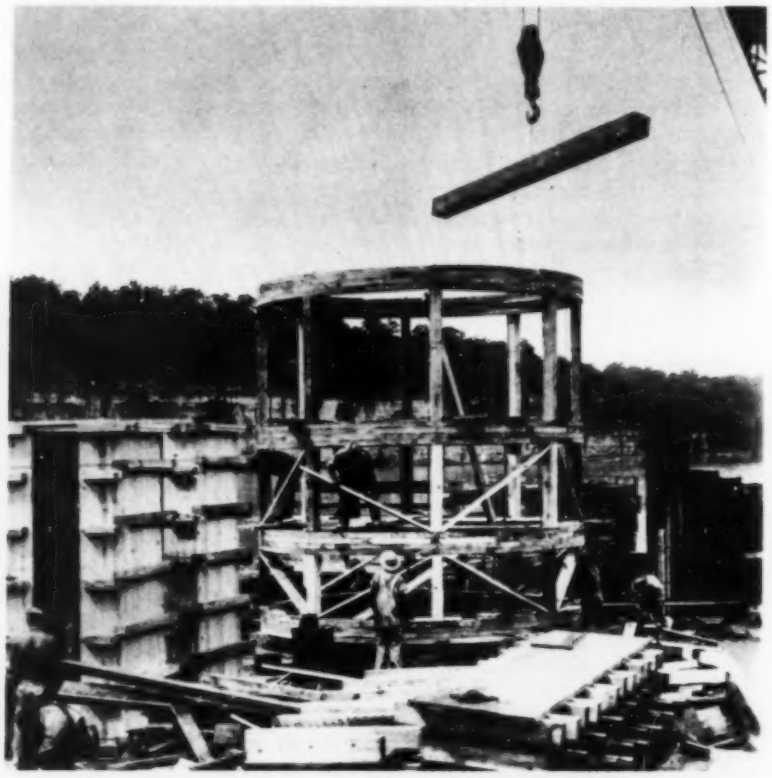
CONSTRUCTION DETAILS *For* *Superintendents and Foremen*



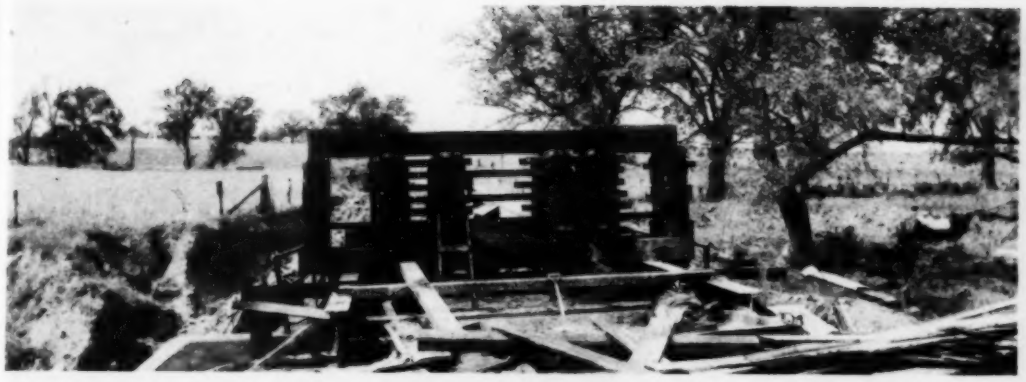
STRAIGHT-EDGE BUMP CHECKER of Iowa Highway Commission consists of board mounted on wheels at two ends, with set-screws installed at intervals between them. Set-screws are adjusted daily on master straight-edge to 1/8-in. tolerance above straight line under wheels, enabling them to scratch any bump exceeding 1/8 in. in 10 ft. Photo from **WILLIAM S. FOSTER,** Rockwell City, Iowa.



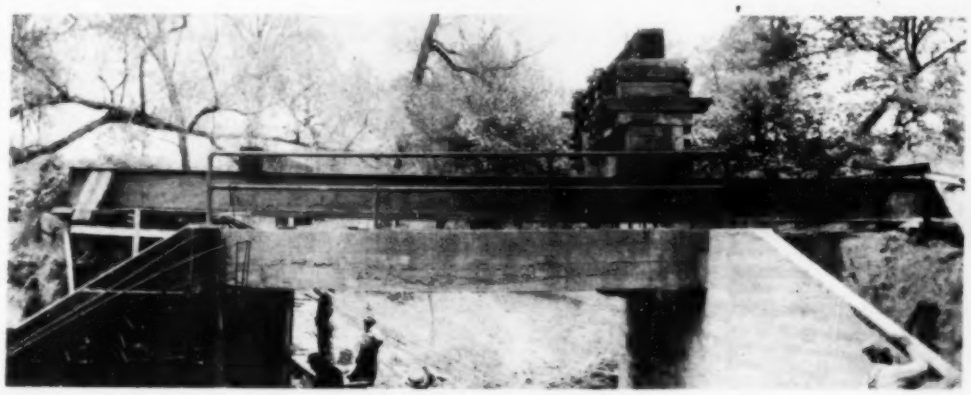
DITCH CHECKS (left) of creosoted pine designed by Arkansas Highway Department stop erosion in sandy soil along Route 179 between Fordyce and Sheridan. On this section, ditch water is stepped down in 1-ft. falls.



TIMBER FRAME for one of 18-ft.-diameter cellular cofferdams of Florence-Sheffield bridge, Alabama, is prefabricated by Hardaway Contracting Co., substructure contractor, Columbus, Ga., for lowering into place as a unit and bracing to bent of temporary timber piling driven into overburden. After closure has been made in wall of 65-ft. steel sheetpiling driven around frame, temporary bracing inside frame is removed to permit excavation by clamshell. As excavation proceeds, frame is lowered and sheetpiles are driven deeper.—Photo from **W. R. BOYER,** Hardaway Contracting Co., Florence, Ala.

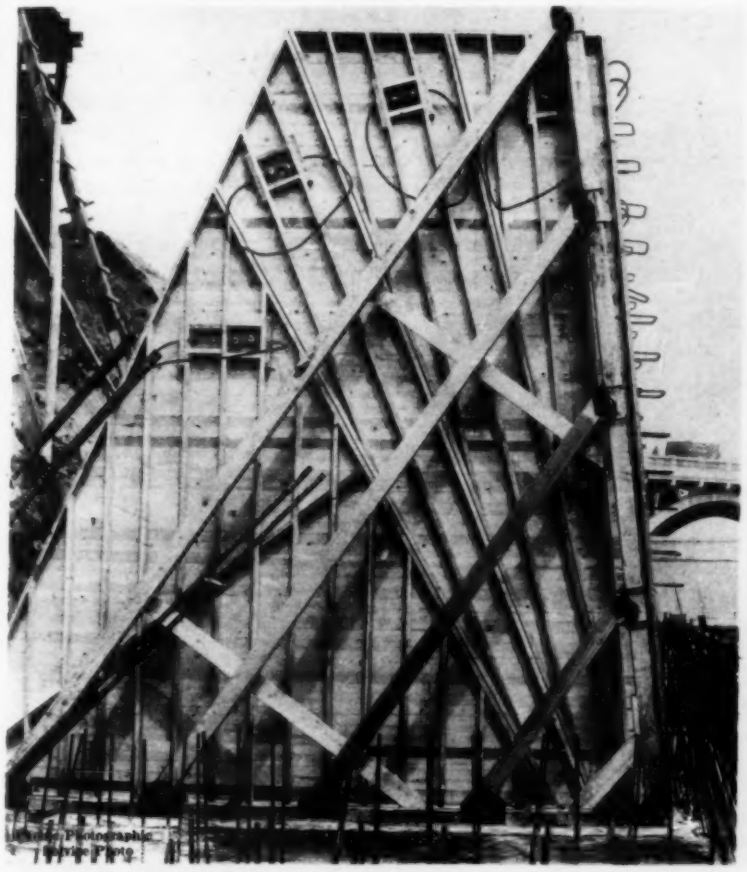


BRIDGE SLAB JACKED UP—"You have heard," writes R. O. SHRIVER, vice-president, Feeney Construction Co., St. Joseph, Mo., " of jacking up the radiator cap on a car and running a new car under it. Well, we jacked up an old concrete bridge slab and placed new abutments under it. One abutment had washed out; so that the end of the slab was down about 4 ft., the other end not quite so bad. It was an 18-in. slab on a 20-ft. span and in such poor condition that we had to reinforce it with 12-in. I-beams. The slab is shown suspended **(above and below)** from two 21-in. I-beams which are supported on a timber cap resting on piling. The writer insisted that it would cost more than an entirely new bridge; but the county authorities thought otherwise, and they were wrong; but why worry about the taxpayers' money?"

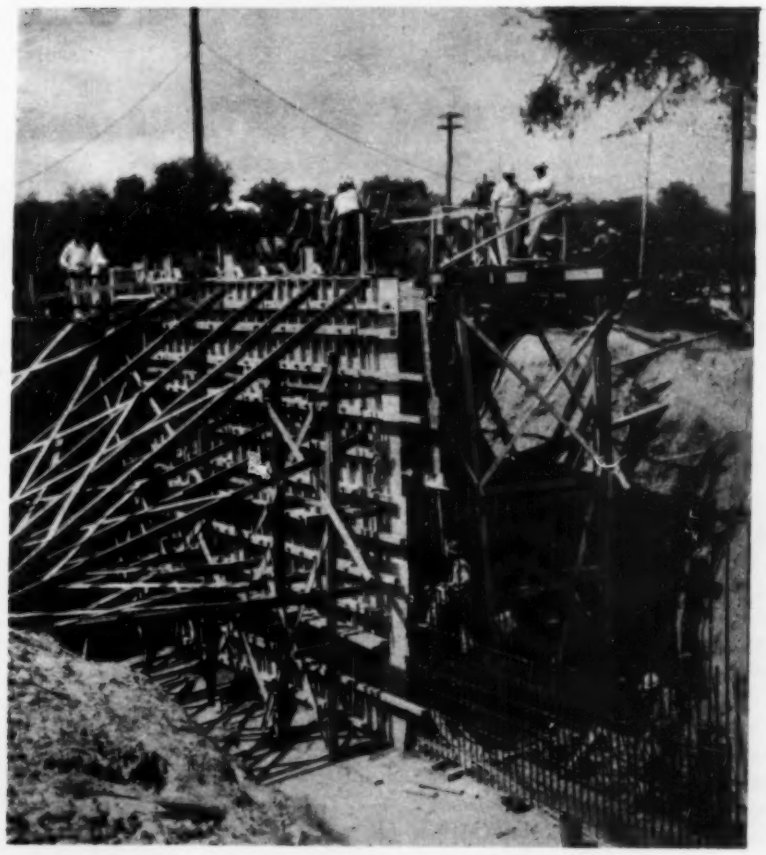


R. A. Wurgel Photo

PREFABRICATED MULTIPLE FORMS lined with plywood speed constructruction of octagonal columns on contract of George M. Brewster & Son, Bogota, N. J., building portion of New Jersey approach to Lincoln Tunnel for Port of New York Authority. Workman smooths top of column before setting cast-steel cap.



ADJUSTABLE COUNTERFORT FORMS designed by U. S. Engineer Office, Los Angeles, Calif., serve whole series of transitions in construction of counterforts for floodwall along Los Angeles River. Wall undergoes succession of changes from counterfort structure 29 ft. high at upstream end to trapezoidal rock-paved section downstream. By using various sizes of wedge-shaped segments above basic triangle and by pivoting main upright and supporting diagonals at lower ends, forward face of form can be brought back as wall slope flattens. Diagonals are cut back to fit each position.

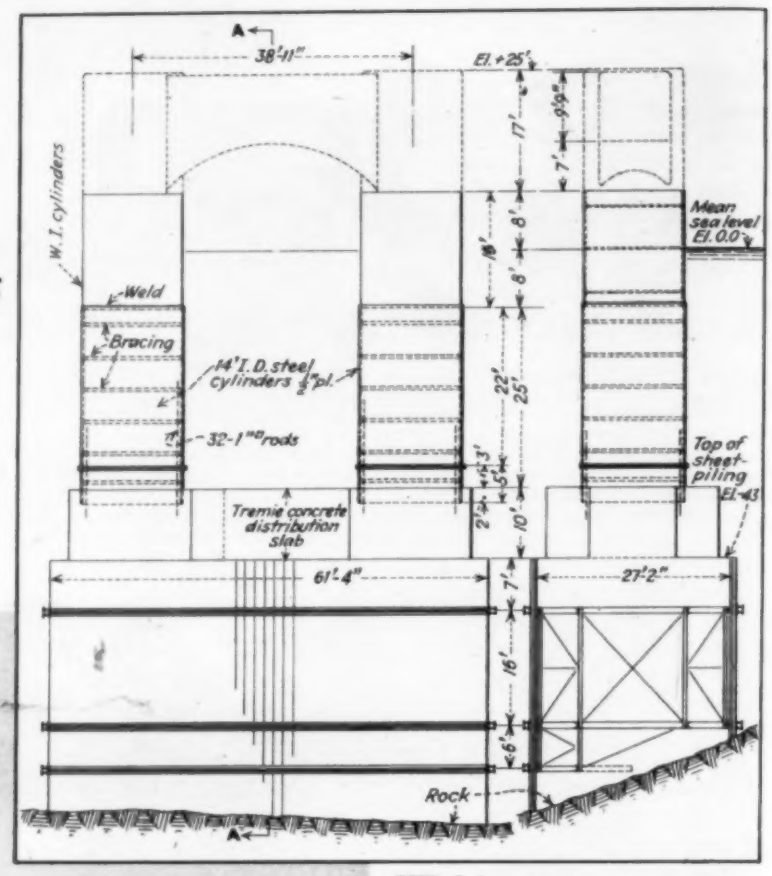


RETAINING WALL MONOLITH 23 ft. high, 4 ft. thick at bottom and 1 ft. thick at top, is concreted in one continuous operation by J. E. Milam Construction Co., contractor, on flood control project at Rome, Ga., under direction of A. A. Anderson, resident engineer for U. S. Engineer Corps. Three elephant-trunk spouts deliver concrete to bottom of form about 30 ft. long with little segregation of mix using crushed rock up to 1-in. size as coarse aggregate. Two internal vibrators are used carefully to consolidate concrete without causing segregation by over-vibrating. — Photo from **PHILIP DAVIS**, concrete technologist, U. S. Engineer Office, Rome, Ga.

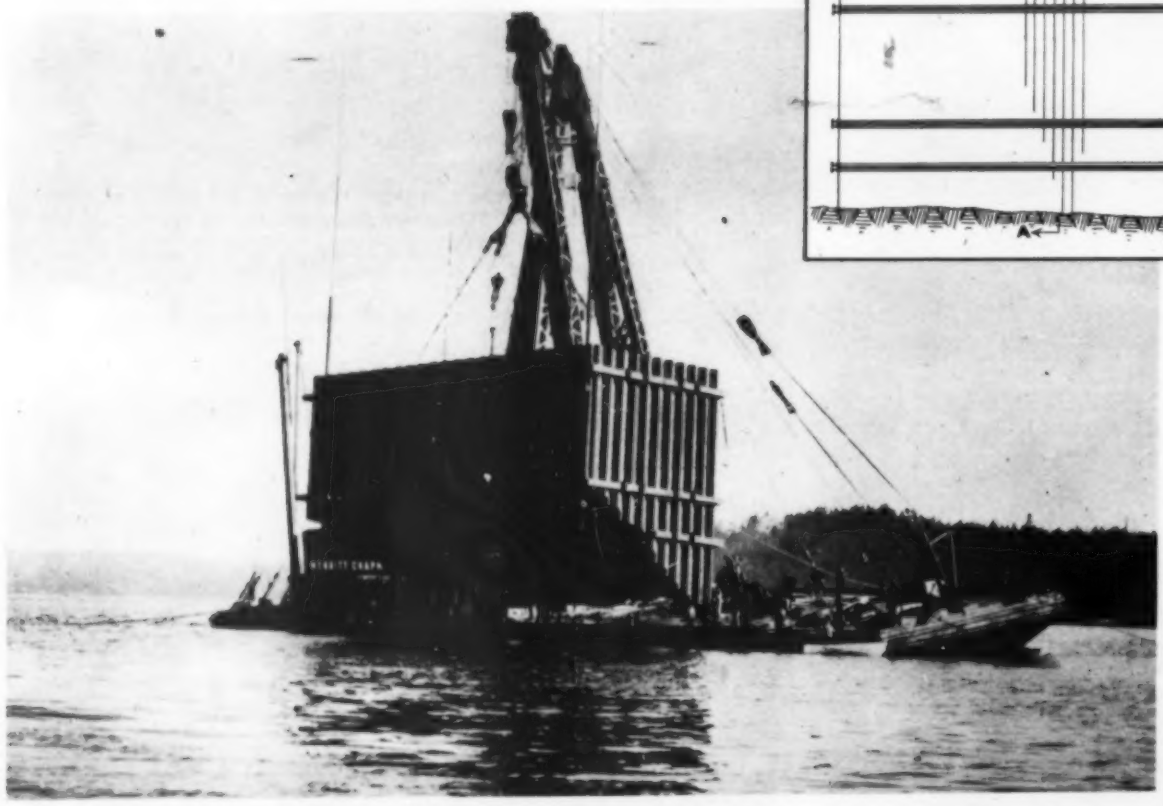
Custom-Tailored Sheetpile Coffers

Mitred to Match Bedrock Contours

Incase Tremied Bases of Bridge Piers

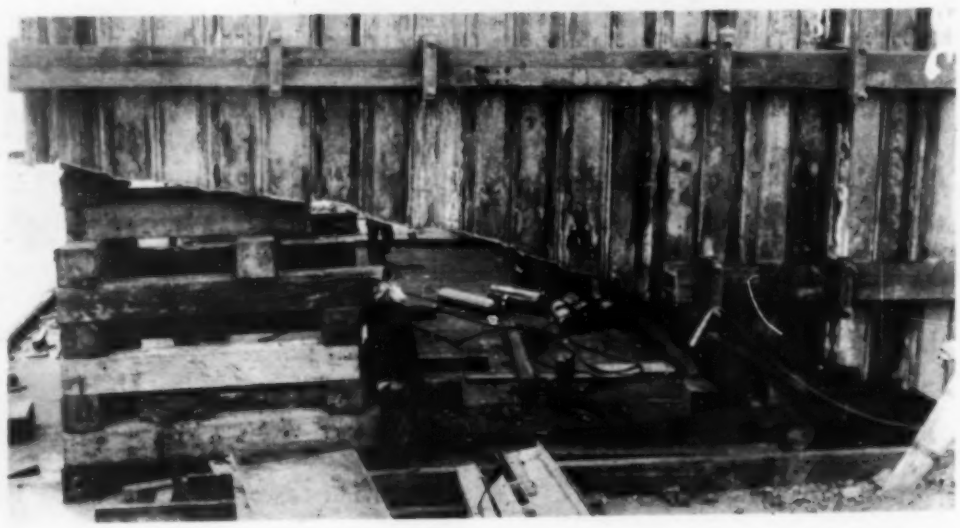


PIER 5 has tremie concrete base section placed in prefabricated steel sheetpile cofferdam cut to fit profile of irregular sloping rock bottom. On top of base, at El. —43, is load-distribution slab 10 ft. thick, likewise placed by tremie in prefabricated steel forms. Two 14-ft.-diameter shafts rising from distribution slab are concreted in dry after pipe forms have been pumped out.



CUT TO FIT rock bottom, cofferdam is raised clear of barge, directly above pier location, by 250-ton floating derrick.

MAKING USE of available plant and equipment to circumvent a difficult marine foundation condition which discouraged conventional methods of cofferdamming, the Merritt-Chapman & Scott Corp., New York, substructure contractor for the Deer Isle-Sedgwick suspension bridge in Maine, prefabricated at its Staten Island yard two 135-ton steel sheetpile boxes, 60 x28 ft. in plan, for the tower pier bases, and shipped them by barges to the bridge site, where the field crew assembled the units, flame-cut the lower edges to predetermined contours of the rock bottoms and lowered the coffers with a 250-ton-capacity floating derrick to their permanent positions, thus satisfying a contract specification that the pier bases be incased in steel sheeting and avoiding the difficulty of driving and holding sheetpiles in shallow earth cover at depths of 78 to 44 ft. below mean water level. Prior to lowering the cofferdams, rock bottoms at the two pier locations were made ready by dredging the shallow overburden from a wide area and washing the rock clean with pressure jets. Tremie concrete for the pier bases was placed inside the coffers to the top of the

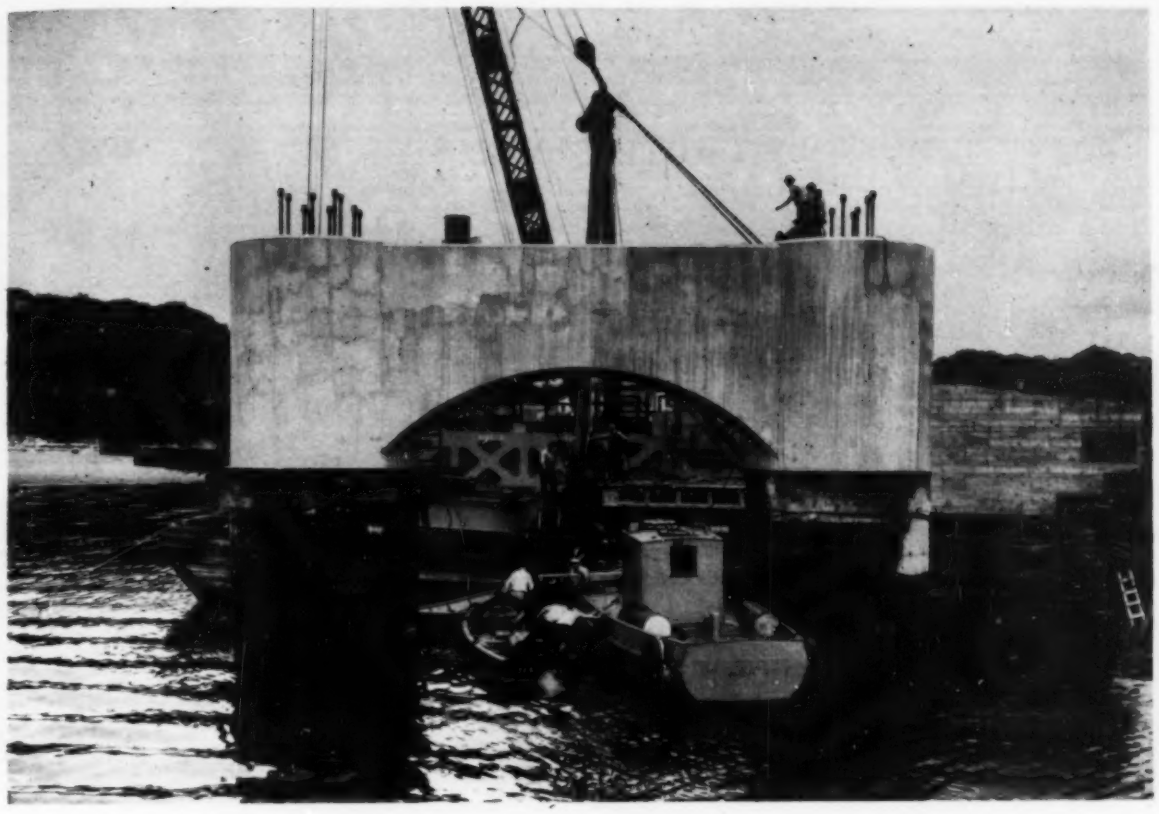


ASSEMBLED COFFERDAM (right), blocked up on barge at bridge site, has its sheetpile walls cut to fit rock profiles determined by plumb-pole soundings.

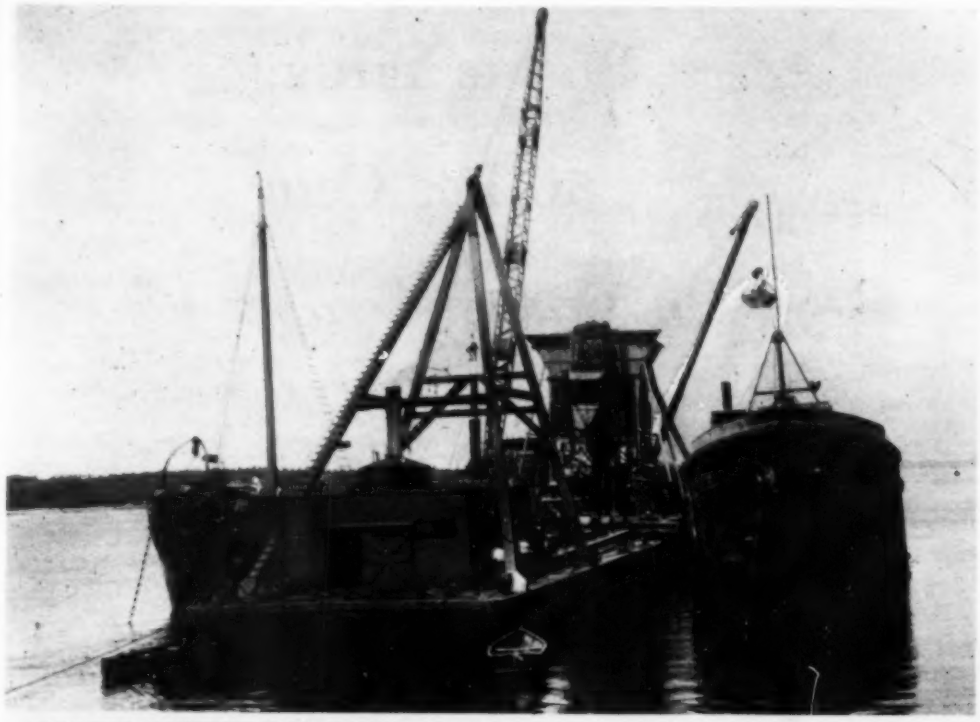
sheeting at El. —43 in the deeper pier and to El. —25 in the shallower pier.

On top of the pier bases the substructure design called for heavily reinforced concrete load-distribution mats 10 ft. thick. The contractor built for these mats steel-plate forms stiffened by structural members which were substituted for the reinforcing bars shown in the original design. These forms and interior structural members were fabricated and assembled at the Staten Island yard in Lower New York Bay and were delivered to the site by barge for lowering and filling with tremie concrete.

Rising from the two ends of each distribution mat are 14-ft.-diameter circular concrete shafts topped out at El. 8, where an arched-soffit cross-strut of 10-ft. width and 10-ft. minimum depth connects the two columns and completes the bent on which the steel tower legs of the suspension span are erected. From a point on the columns just below the springing line of the arch (8 ft. above mean water level), to a point 8 ft. below water



COMPLETED PIER, ready for erection of tower steel, has arched cross-strut between cylindrical shafts protected by wrought-iron casing.

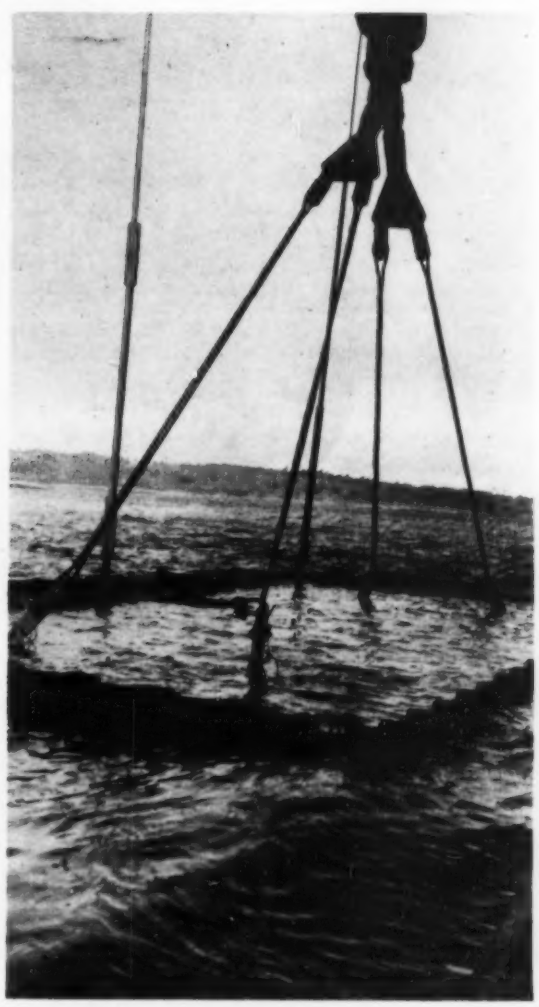


FLOATING CONCRETE PLANT deposits tremie concrete through flexible metal spout from tower hopper.

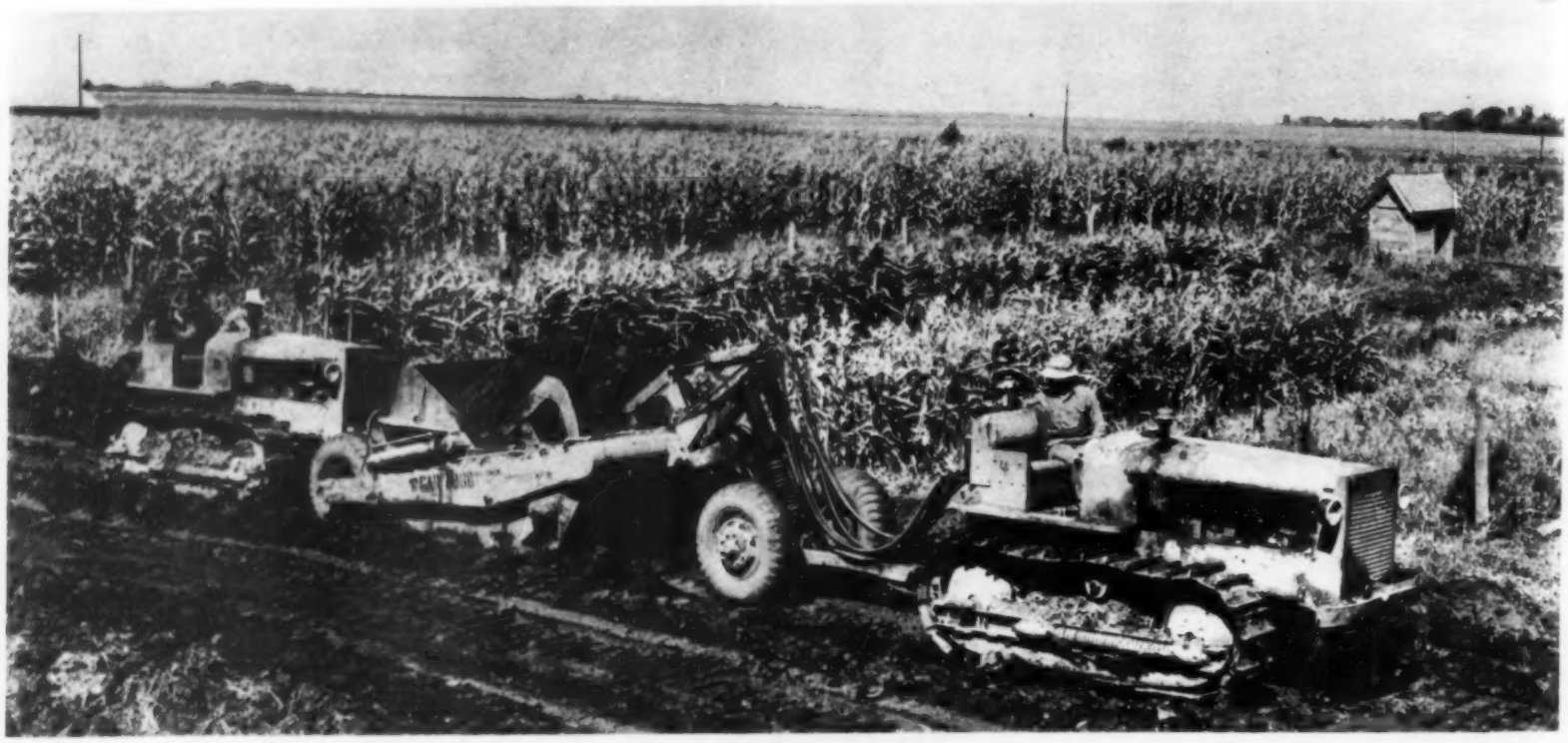
level — a vertical distance of 16 ft. — specifications required that the shaft be incased in a wrought-iron shell to protect the concrete against action of sea water. Specifications further required that all shaft concrete be placed in the dry.

To satisfy this requirement, the contractor improvised a continuous pipe form from the distribution mat to the top of the wrought-iron shell. In the prefabricated structural framework of the distribution slab, the fabricators incorporated at the location of each shaft a flanged nipple of 14-ft.-diameter pipe, using a 5 ft. section which extended 2 ft. below the top of the distribution slab and 3 ft. above it. To fill the gap between the nipple and the bottom of the wrought-iron collar, the con-

(*Continued on page 62*)



HOISTING GEAR (right), consisting of four pennants hooked to upper horizontal bracing frame, lowers cofferdam to position underwater. Range poles installed in prefabricated box enable instrumentmen to line in cofferdam from shore.



PUSHER TRACTOR operating against bumper block at rear of scraper cuts loading time and loading distance by practically 50 per cent. Pusher tractor carries front-end bumper plate backed up by coil springs to relieve shock.

Pusher Tractor in Loading Pit

Boosts Yardage

50 Per Cent

On Tractor-Scraper Job

TWO SHREWD CONTRACTORS. GLEN PERRY **(left)** and H. H. HUDKINS, operating under subcontracting arrangement with George W. Condon Co., Omaha, Neb., improve scraper production by adding booster tractor in loading pit.

REAR-END BUMPER protruding beyond pneumatic tires of scraper carries timber block which takes impact of pusher tractor.

ALTHOUGH the tractor-scraper method has cut costs of earth-moving on many types of jobs in recent years, it remained for Hudkins & Perry, contractors on a 7-mi. stretch of State Highway 37 between Onawa and Turin, Iowa, to effect additional savings by correcting the most glaring weakness of the ordinary set-up — apparent waste of tractor power. By using a booster tractor as a pusher to assist scraper loading, the contractors cut loading time and materially increased production of their scraper outfits.

Wasted Power—The earth-moving cycle on an average job of about 1,000-ft. haul divides itself as follows: 20 per cent of the time for loading and the remainder for hauling, dumping and returning. The crux of the problem lies in the period required for scraper loading, which occupies only 20 per cent of the complete cycle. In loading the average 12-yd. scraper, it takes from 80 to 95 tractor drawbar horsepower to get a 9.5-yd. payload, depending upon the design of the scraper and the condition of the soil. Furthermore, it takes from 1.25 min. to 2.0 min. to load in distances varying from 125 to 175 ft. As soon as the scraper is loaded, the tractor can be shifted into high travel speed, because the power required is considerably less. The inefficiency of the method lies in the fact that an 80- to 95-hp. tractor is required for the loading operation, occupying only 20 per cent of the time, whereas thereafter a tractor of considerably less power can handle the scraper during the haul to the fill and return, or 80 per cent of the time.

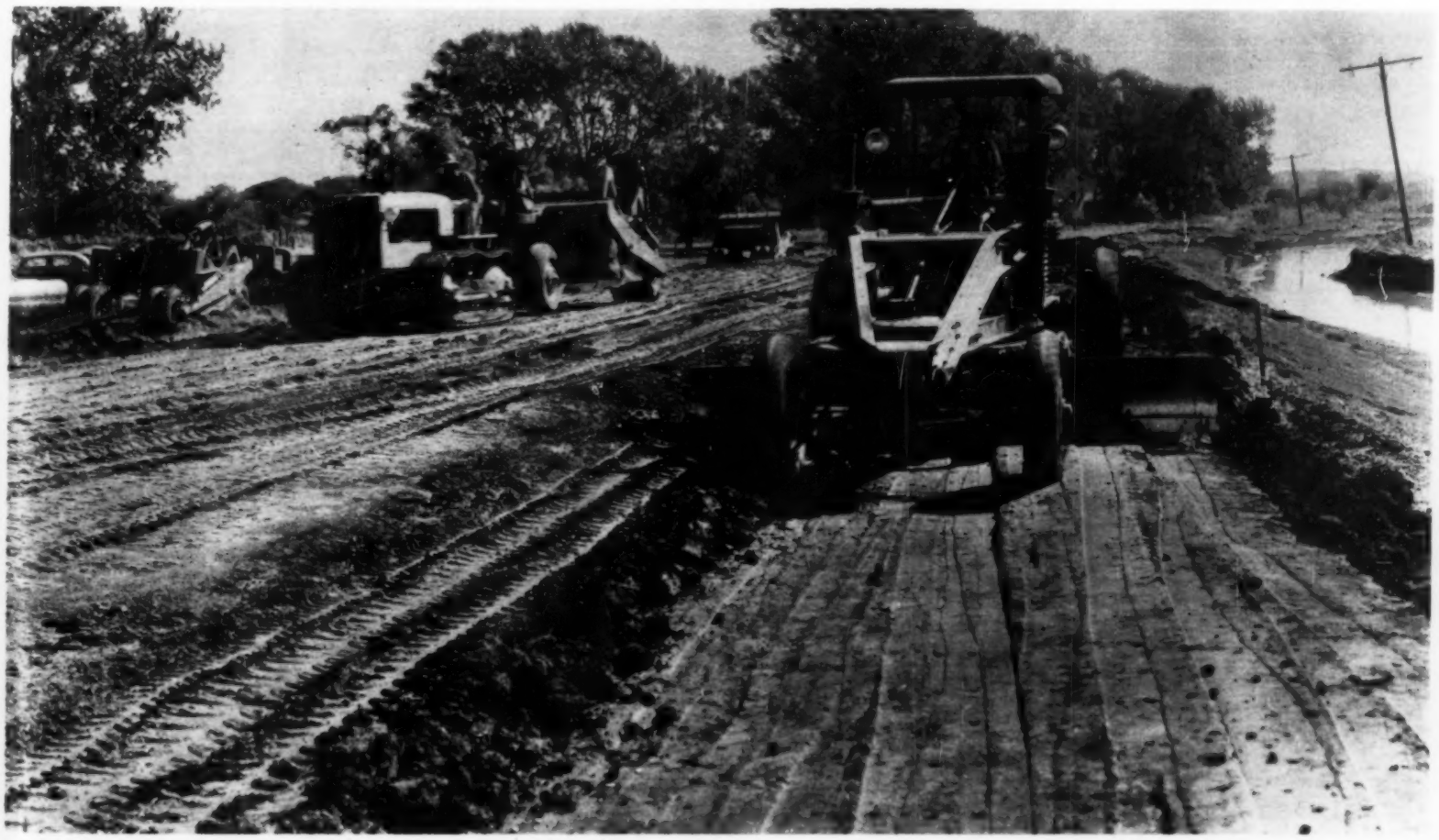
CAPACITY LOAD for built-up 11-yd. scraper is assured by taking deep bite and pushing with booster tractor.

Many attempts have been made to correct this situation through redesign of the scraper but with little success. It remained for Hudkins and Perry to solve the problem.

Job Conditions — Their road job lay through rolling hills and the toughest kind of Iowa gumbo. Added to these hazards was a season of abnormal rains in which it was not uncommon to have several inches of rain per day. Iowa gumbo is considered "tough going" by those members of the construction industry who have had the problem of working it. In Monona County, it is a brownish clay, hard and powdery when dry, stiff and sticky when wet. No matter what weather conditions are encountered on a job in this material, there are always many problems to be solved before the most efficient method of handling can be evolved.

Hudkins and Perry tackled the job with four 80-hp. Allis-Chalmers diesel fuel tractors pulling Gar Wood L-12 hydraulic scrapers. Despite the adverse conditions encountered, the scrapers averaged 8 pay yards per load and were loaded in 1.5 min. in a distance of 150 ft. Heavy rains continually slowed down the job, and, with winter rapidly approaching, it became imperative to move dirt faster.

(Continued on page 69)



MOTOR PATROL GRADER keeps hauling roads in shape to facilitate fast travel by tractor-scraper outfits between loading pit and dumping point.

Present and Accounted For

A Page of

PERSONALITIES

ELECTED PRESIDENT of American Public Works Association at recent New York meeting, GUY BROWN, sewer engineer, St. Louis, heads association activities for current year.

GUNTERSVILLE DAM on Tennessee River is now more than half completed under direction of VERNE GONGWER **(left)**, project engineer for Tennessee Valley Authority. Dam is being built in three stages: (1) navigation lock, (2) spillway and (3) power house and intake structures.

APPOINTED CONSTRUCTION SUPERINTENDENT at TVA's Guntersville dam on Tennessee River in northern Alabama, BENJAMIN S. PHILBRICK, formerly assistant construction superintendent at both Guntersville and Wheeler projects, succeeds George P. Jessup, promoted to project manager of Gilbertsville job.

COLORADO-BIG THOMPSON PROJECT is directed for U. S. Bureau of Reclamation by PORTER J. PRESTON, supervising engineer. Project, estimated to cost $44,000,000, will divert water from Colorado River headwaters through 13-mi. tunnel under Continental Divide to irrigated areas in northeastern part of Colorado.

OFFICIALLY NOMINATED for president of American Society of Civil Engineers at society's recent meeting in Rochester, N. Y., DONALD H. SAWYER will take office following election at winter meeting. Mr. Sawyer is special assistant to director of procurement, U. S. Treasury Department.

A REVIEW OF LABOR CONDITIONS IN THE CONSTRUCTION INDUSTRY

(Continued from page 33)

one who puts together the rough forms for concrete construction. A bricklayer building rough manholes is very different from a bricklayer laying brick for a high class apartment or office building. An electrician extending wires in a tunnel is not required to have the knowledge or the skill of an electrician installing the electrical facilities in an important building. The same comparison can be applied to almost every class of labor in the construction industry, and yet one of the chief causes of labor disturbances and disputes arises from the insistence of the Building Trades Council that all workmen in the same craft shall not only be paid the same rate of wages, without regard to the degree of skill required, but, what is the more conflicting, that workmen in heavy engineering work shall be governed by the same arbitrary and restraining rules that obtain in the construction of buildings. Then, too, no consideration is given to the fact that work on a building generally only lasts a few months at the most, while work on a heavy engineering construction project usually gives continuous employment for from one to four years and often longer.

Multiplicity of Unions

Additional emphasis will be given to my contention that there is a vast difference between the workmen of the two types of construction when I quote from the publication of the Building Trades Employers' Association of New York, under date of Oct. 1, 1935, which states:

> *"In New York City the building trades have over 50 separate unions. Even now are more in the making."*

Certainly any engineering structure can be built with possibly eight, and not more than twelve, different trades. It is this unnecessary multiplicity of craft unions that breeds the provocative and annoying jurisdictional disputes usually causing the costly stoppage of work, with which the employer and the employee have nothing whatever to do, but always pay the cost.

This multiplicity of wholly unnecessary local unions creates a situation where each, of necessity, competes with the other to win concessions favorable to the union organization it represents which, of course, is the life blood of any labor organization. Frequently the unions uphold the workmen in flagrant violations of good workmanship and raise the strongest objections to workmen being discharged at the will of the employer for any cause whatever. All of this is having a deplorable and dangerous effect on the morale of the workmen and on the industry as a whole. The most complete spy system ever resorted to in any industry has been perfected and is used by the local unions through the appointment of a "steward" representing each local union on each job, whose duty it is to report to his local headquarters the most trivial and often unavoidable infractions of the union's self-imposed rules and regulations, which are immediately charged as a violation against the employer.

This condition is giving grave concern to the progressive, responsible and conservative leaders of the labor movement, whose efforts have always been to require conditions of employment economically satisfactory to the employer, employee and the owner. They realize that repressive conditions and exorbitant costs bring about a curtailment of the industry, with its resulting enforced unemployment. These responsible leaders realize that if the rank and file continue to get out of control, it is possible that a Frankenstein may be created detrimental to the entire labor movement, with disastrous results affecting the entire construction industry.

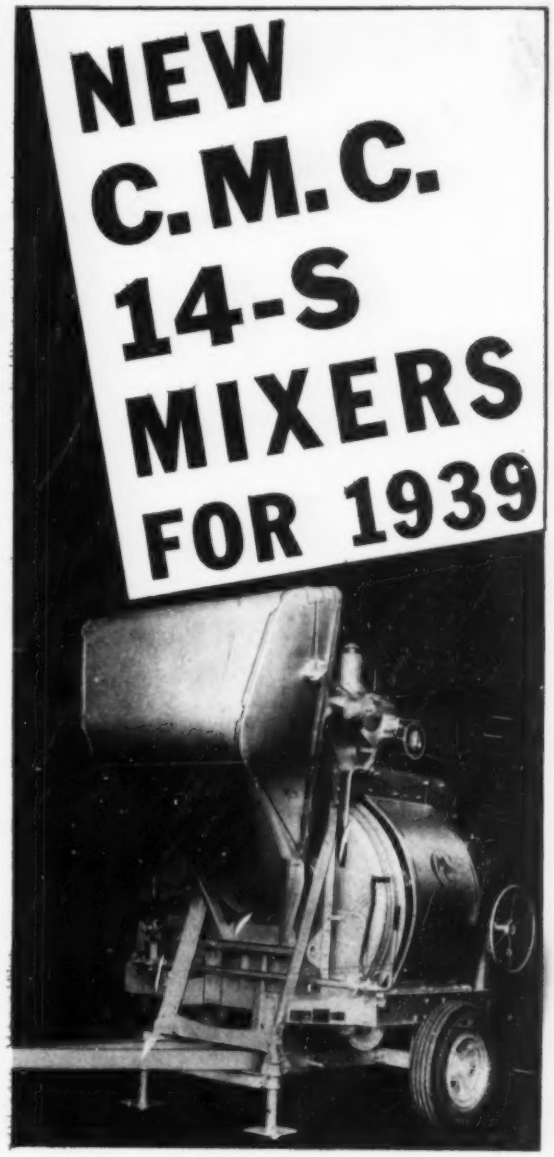
Right at this moment, while this is being written, we have an amazing situation in New York City. One local union has called a strike and is picketing a construction job against another local union, both members and part of the same International, notwithstanding that an agreement is in existence executed by the officers of both locals and approved by the International president. This, of course, is a flagrant violation of their agreement and a gross disobedience of the by-laws of their International, and yet this condition has been able to exist for more than 10 days, closing down a large construction operation, in spite of the efforts and the commands of the International officers.

I have referred in detail to these matters because, as I see the picture, the employers are anxious for and welcome the opportunity of sitting down with their employees to negotiate and bargain collectively as to rates of wages and rules of employment. Nevertheless, the attitude of the representatives of the employed, an attitude derived from the power which has been given to them chiefly through political expediency, reduces collective bargaining merely to words and means nothing whatever.

It has been my experience, and it is my sincere belief, that all contractors honestly believe that labor not only has the right, but the urgent necessity, to organize in order that it may negotiate and bargain collectively and thereby conclude agreements as to rates of wages and conditions of employment. It is certainly my own preference, and I believe it is the preference of all contractors, particularly those in the great metropolitan areas, that labor should be strongly organized and should enter into bona fide agreements, thereby stabilizing labor conditions in the industry. But it is apparent to all who have gone through the experience in recent years that, while labor has been given almost unlimited power, it has failed to create a leadership that recognizes that an agreement entered into must be carried out and obeyed by both parties; or a leadership that realizes that there is a limit to demands that may be imposed without regard to the economic value of the finished product. If persisted in, these demands must bring about a curtailment in the industry, with the resultant enforced unemployment of the members of labor organizations.

Labor has derived its power from Government, but this same Government has failed to set up any

(Continued on page 56)



■ CMC 14S 2-Wheel End Discharge Trailer

■ CMC 14S 4-Wheel Side Discharger

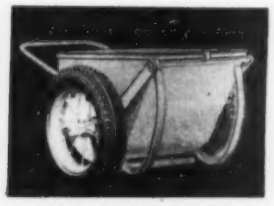
■ CMC 14S 4-Wheeler End Discharger

Here's big daily output with lighter weight and new fast handling ease. These models meet every job situation. They are TOP PROFIT MAKERS and like all modernized CMC equipment are built to stand the "gaff" of continuous production.

• CMC Dual Prime Pumps — faster priming — greater efficiency — capacities from 1½" up.

Ask about the advantages of CMC Mixers all sizes, Plaster and Mortar Mixers, Dual Prime Pumps, Hoists, Saw Rigs, Pneumatic Tired Carts and Barrows before you buy.

• CMC General Utility Double Drum Hoists. 100% Hoist efficiency without extravagance in cost.



• CMC Pneumatic Tired Material Carts. Save planking — cut handling costs.

CONSTRUCTION MACHINERY CO.
WATERLOO, IOWA

How The Other Fellow Did It — *by Dig'n Digger*

a review of records made by contractors

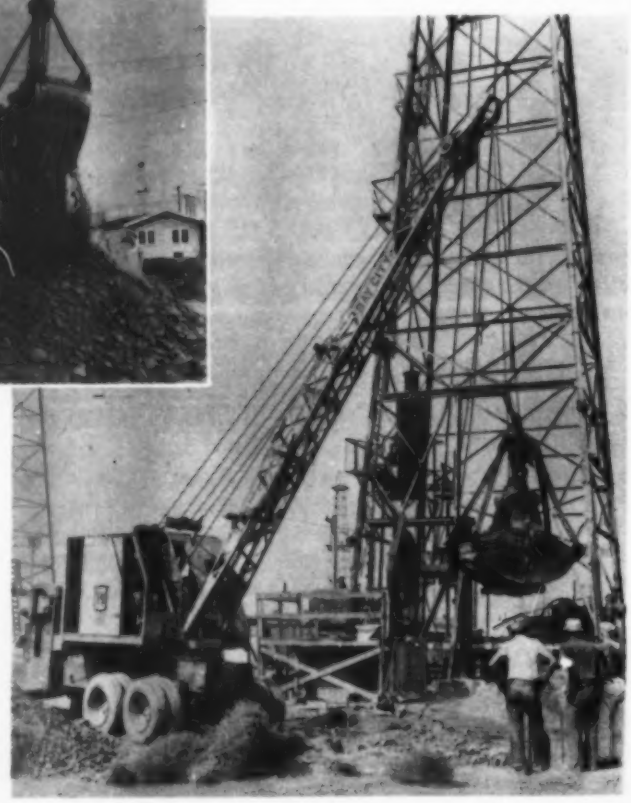
Mobility of Truck Crane permits wide range of work at a profit . . .

For contractors who want to be in a position to handle those small scattered jobs (or big jobs too for that matter) profitably, there is an interesting story in the experience of Ansco Construction Co., Long Beach, California, who find the mobility and flexibility of their BAY CITY Truck Crane of real value when combined with the outstanding stability of this rig.

BAY CITY Model 15 Truck Crane owned by Ansco Construction Co., Long Beach, California, working for Wilmington Oil and Development Co., Wilmington, California.

Their Model 15 equipped with shovel attachment and combination dragline and crane boom is ready to do any kind of work. According to Mr. Murphy, one of the owners, they keep this machine busy in oil field work—digging sumps, pits, trenches, hoisting concrete and steel and other miscellaneous jobs. Photos show Truck Crane equipped with ¾ yd. Owen clamshell digging a pit for the Wilmington Oil & Development Co.

These machines will move in and out of jobs wherever trucks will go. For real performance and real money making opportunities you can't beat these fast, easy to operate truck mounted units, built along proven BAY CITY design with power, speed and endurance. Complete details in catalog 10-B—ask for it, there is no obligation. Write Bay City Shovels, Inc., Bay City, Michigan.



"Advertisement"

(*Continued from page 55*)

authority or tribunal to discipline the abuse of this power. The result is that the employer, while under compulsion to accept the frequently immoderate, exorbitant and even frivolous demands made upon it, has no redress or recourse. I earnestly believe, because these conditions have been indirectly imposed by Government, that such a tribunal is urgently necessary.

A Suggested Remedy.

In the June, 1937, issue of *Construction Methods and Equipment* I suggested two alternatives:

(1) That the labor organizations assume full responsibility for their actions by placing themselves in a position where they can sue or be sued and have damages levied for or against them.

(2) That a neutral commission, authority or tribunal be created in and by each state to determine wages, hours and conditions of employment for a given period of time, to hear and adjudicate every violation or complaint, its decisions to be equally binding on employer and employee, with a provision for appeal by either party to a court of last resort.

I agree that the first suggestion is almost fantastic, as it is hard to conceive that any governmental agency would be sympathetic to such a proposal. The reactions to the second suggestion, from contractors more experienced than I, was that such an authority or tribunal would place the construction industry under still greater governmental jurisdiction, but it seems to me we are already suffering from an all too great governmental supervision which we have no possible means of evading, no matter how desirable it would be to do so. We are already there. What we do not have, and what is most urgently needed, is some place where we can take the troubles which have been thrust upon us, with a reasonable possibility of getting fair and just remedies.

Public opinion must be aroused to the point of demanding conditions under which the construction industry may operate, as it used to operate, in an amicable, efficient and economical manner.

Low-Alloy Steel Welding Rod

A LOW-ALLOY STEEL WELDING ROD, for applications requiring welds of particularly high strength, has been developed by The Linde Air Products Co., of New York City, primarily for insuring uniformly high-quality welds in high-strength steel pipe and plate. This rod is said to develop an average tensile strength 10,000 to 12,000 lb. per square inch greater than rods previously used for pipe welding, yet has sufficient ductility to meet most requirements.

Another characteristic of this new rod is its exceptional resistance to overheating in the molten state. Because of this, the rod is particularly suitable for use with the new four- and six-flame tips which have recently been developed for welding pipe lines. When applying this rod, the weld metal sets up more rapidly, making it easier to control the puddle on a curved or vertical surface

AUTOMOTIVE HAULAGE

(*Continued from page 47*)

speeds forward. The following illustration is an example of what relative productions might be obtained from two units differing only in respect to range of speeds of transmissions.

Unit A has five speeds forward — 2, 4, 7, 11 and 20 m.p.h.

Unit B has five speeds forward — 4, 8, 14, 22 and 40 m.p.h.

Hauling conditions are such that 20 m.p.h. is the maximum consistent with the roughness and the confines of the haul road. Rolling and grade resistances are so high that travel speeds vary between 4 and 20 m.p.h. Both of these conditions are typical of the average construction job.

If we assume that equal fractions of 1 mi. of haul are traveled in the gears between 4 and 20 m.p.h., average travel times are as follows:

Unit A travel time for 1 mi. equals

$$\frac{1/4}{4} + \frac{1/4}{7} + \frac{1/4}{11} + \frac{1/4}{20} \text{ or } 0.133 \text{ hr.}$$

Unit B travel time for 1 mi. equals

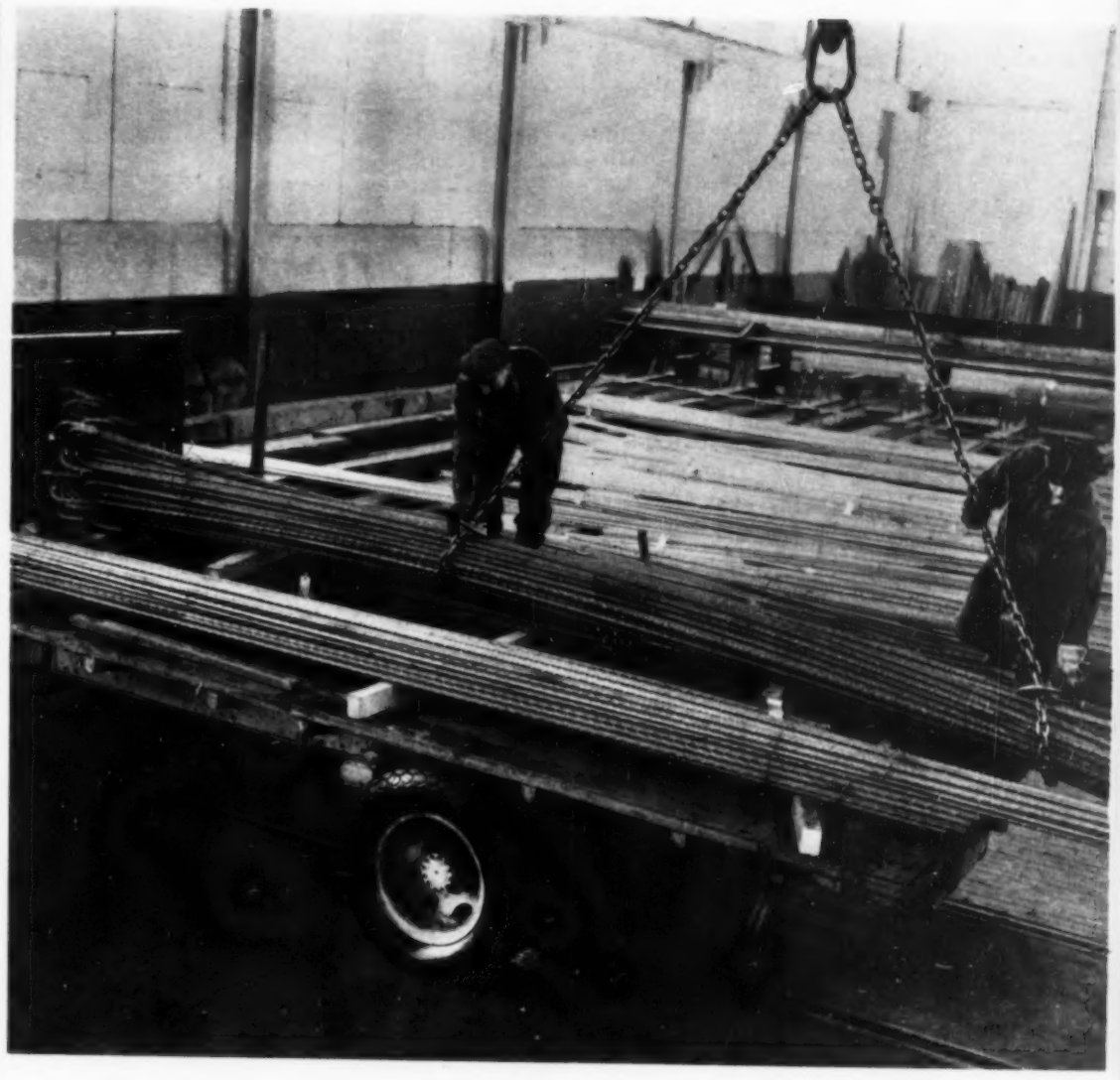
$$\frac{1/3}{4} + \frac{1/3}{8} + \frac{1/3}{14} \text{ or } 0.149 \text{ hr.}$$

Thus, by reason of proper gear ratios, unit A is able to save 11 per cent of hauling time as against unit B. Referring to the fact, brought out in the September article, that an average of 31 per cent of gross round-trip time is spent in hauling, it is apparent that correct gear ratios can increase production by at least 3 per cent. In this respect, it is correct to say *at least* 3 per cent, because the analysis has neglected the less important influence of proper gear ratios upon times for turning at dump, returning, and turning at the loader — a group of elements which total 31 per cent of gross round-trip time. It is entirely reasonable to state that the difference between good and bad ratios may account for a 5 per cent difference in unit costs.

Traction and Flotation — Traction and flotation characteristics are intimately associated in a hauling unit. Because they govern the unit's rolling resistance, colleague of grade resistance in absorbing power, they help to determine average travel speed. Tire manufacturers have gone far to pioneer traction and flotation. Tires now range up to the mammoth 18.00x24, twenty-ply size, capable of sustaining a load of 18,000 lb. in continuous service over difficult terrain. Both ground-grip and lug-type tires are in common use, the former being especially adapted to hauls involving traction difficulties and the latter being especially adapted to hauls involving excessive tire wear. On the Mississippi River levees, hauling units mount ground-grip tires to cope with slippery gumbo, and in the Pennsylvania anthracite coal fields the units are equipped with lug-type tires for severe rock hauling service.

According to Arnoux, the coefficient of friction of rubber tires varies from 0.67 for dry macadam to 0.06 for wet slippery roads. As reported by

(*Continued on page 58*)



Reinforcing bars *rushed from warehouses in* **key cities**

Whether your order is large or small you can count on quick delivery when you order Reinforcing Bars from Bethlehem. Large stocks, strategically located, place this company in a position to supply steel quickly to any location.

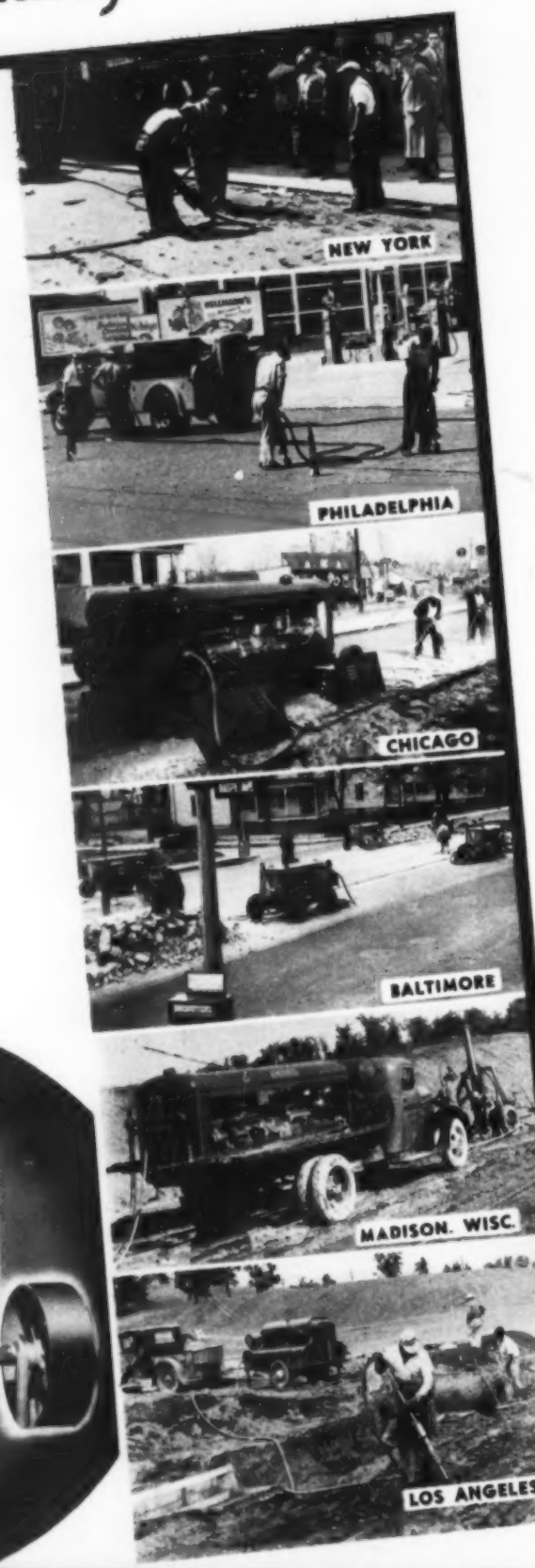
When bending facilities are not available on the job, we are prepared to cut and bend bars to fit specifications. Bars furnished plain or deformed, round or square.

A call or postcard to our nearest district office will bring complete information on Bethlehem warehouse service.

BETHLEHEM STEEL COMPANY, General Offices: Bethlehem, Pa. District Offices: Albany, Atlanta, Baltimore, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Columbus, Dallas, Detroit, Honolulu, Houston, Indianapolis, Johnstown, Pa., Kansas City, Mo., Los Angeles, Milwaukee, Nashville, New Haven, New York, Philadelphia, Pittsburgh, Portland, Ore., St. Louis, St. Paul, Salt Lake City, San Antonio, San Francisco, Savannah, Seattle, Syracuse, Toledo, Tulsa, Washington, Wilkes-Barre, York. Export Distributor: Bethlehem Steel Export Corporation, New York.

BETHLEHEM STEEL COMPANY

SWEEPING THE COUNTRY!
SCHRAMM "*Utility*" COMPRESSORS



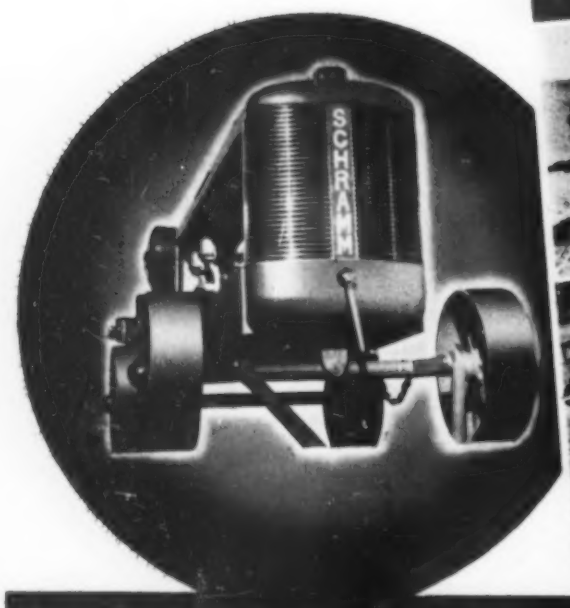
There are reasons . . . for the hundreds of new SCHRAMM "Utility" Compressors scattered on the big jobs of big contractors, in remote sections or on busy city streets.

The reasons are . . . more profit for the contractor because SCHRAMM "Utility" Compressors give him the world's most modern compressor, features for faster, easier handling, lower operating cost and longer life.

SCHRAMMS are sweeping the country—from coast to coast. The list of important users is growing every day as the construction world recognizes a truly modern air compressor.

See for yourself, what other contractors are getting in SCHRAMM "Utility" Compressors. Write for Bulletin 3700-AD.

SCHRAMM, INC.
West Chester, Penna.



SCHRAMM AIR COMPRESSORS

(*Continued from page 57*)

Marks, the rolling resistance of rubber tires varies from 34 lb. per ton on good macadam to 500 lb. per ton for sand-clay roads. These values and observations indicate that traction, unfortunately, decreases as rolling resistance increases. As illustrated by the accompanying photograph of Mississippi River levee work, tire builders circumvent this paradox by tread designs which increase traction and by large tire dimensions which decrease rolling resistance.

A semi-trailer bottom-dump unit, equipped with 18.00x24 tires, will travel about 25 per cent faster over a soft fill than a rear-dump unit, equipped with 12.00x24 tires, in spite of the fact that engines, transmissions, rears, and gross loads are about the same. The 25 per cent faster travel speed is maintained even though only 38 per cent of the gross weight of the semi-trailer unit is on the driving wheels, as against 75 per cent in the two-axle unit.

Manufacture of wide low-pressure tires with large rolling diameters has facilitated efficient operation over the most difficult of soft, rough, and slippery terrains.

Performance Chart—An accompanying performance chart presents a graphic relationship connecting the four factors: horsepower at wheels, gross load in tons, total unit resistance (rolling and grade) in pounds per ton and travel speed in miles per hour. The broken line on the chart indicates the method of determining travel speed when the other three factors are known, using for this example the hauling conditions illustrated by an accompanying photograph.

This photograph shows an unusual "power" haul. A diesel engine of 125 to 150 standard-net-stripped-engine hp. is hauling a gross load of 30 tons of truck and iron ore up 2,200 ft. of 10 per cent grade. Assuming horsepower at wheels of 100, rolling resistance of 40 lb. per ton and grade resistance of 200 lb. per ton — giving a total of 240 lb. resistance per ton, with gross load of 30 tons, the performance chart gives 5.1 m.p.h. as travel speed on the grade. Actual average travel speed on this grade at the mine is 5 m.p.h.

❖

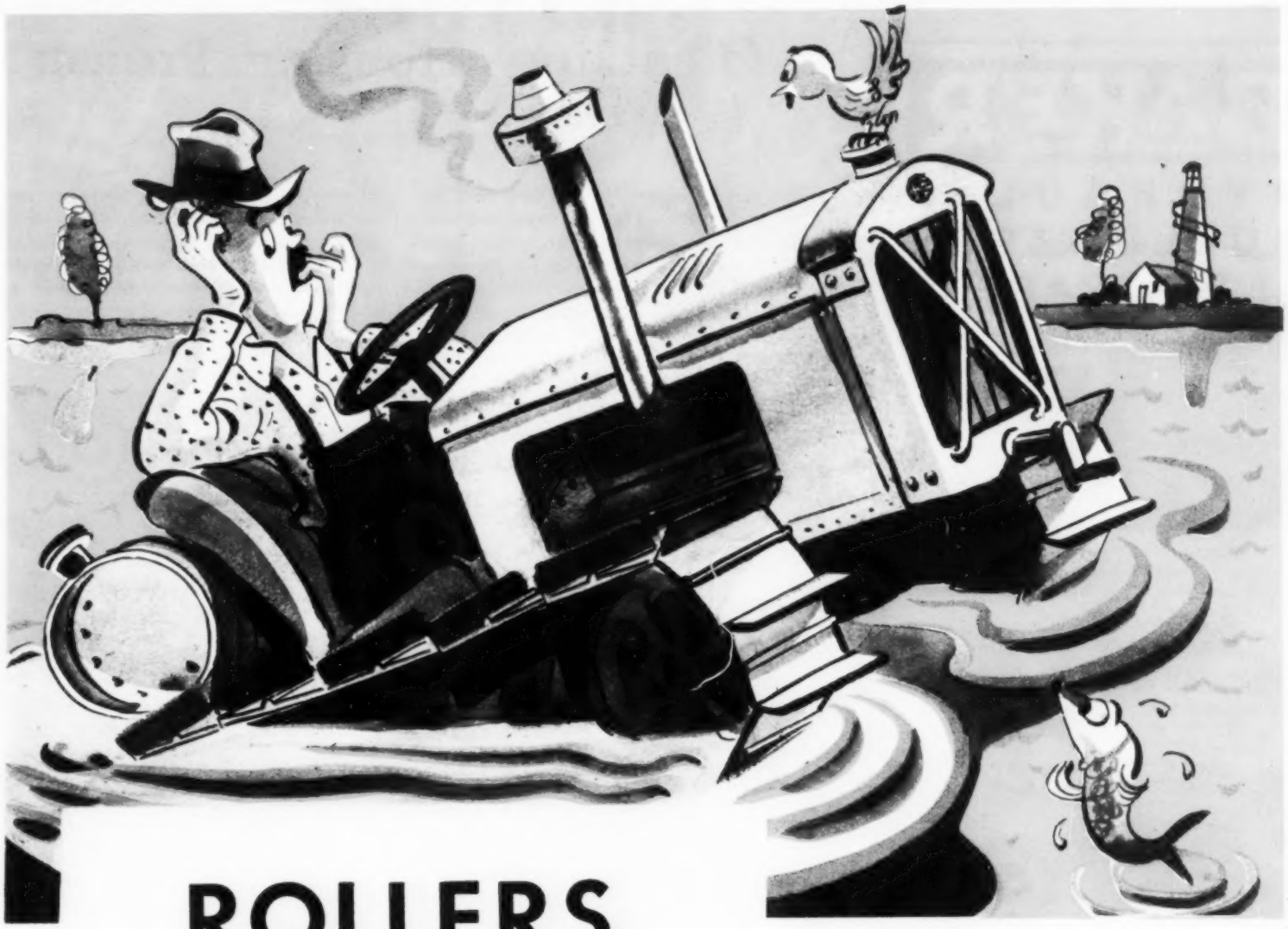
ANOTHER ARTICLE by Horace K. Church, to appear in an early issue, will describe methods: (1) of estimating payload and (2) of estimating unit hauling costs, based on the three factors of round-trip time, payload and hourly cost of ownership and operation.

Safety Ladder Chain

WHEN AN EMPLOYEE of a public utility company started to descend a ladder leaned against a pole, it twisted and both man and ladder fell to the ground. The man struck his head on a rock and was killed. The top rung of the ladder was leaning against the pole providing only a minimum of contact between the rung and the pole.

Following the investigation of the accident, the top rungs have been removed from all ladders to be used in operations of this kind, and in place of the rungs loose chains have been installed. Thus, when a ladder is placed against a round object, the chain conforms with the shape of the object and gives the ladder much better support.

Also, ropes are now provided top and bottom on each ladder, that ladders may be lashed in place whenever necessary.—*National Safety Council*



ROLLERS RAN "DRY" UNDER WATER

Shell showed this contractor how to lubricate tractors working in water

BABLER BROTHERS, contractors of Portland, Oregon, were engaged in shifting the channel of the Molalla River in Clackamas County, Oregon.

In order to deepen and shift the channel it was necessary for the big tractors and bulldozers to drive right into the river itself to pick up gravel from the river bed. The lower half of these tractors was under water many times daily—and the tracks were never really dry.

Naturally, lubrication problems were plaguing this contractor. Lubricant was washing out of the track rollers . . . bushings ran dry constantly and had to be replaced . . . the rollers were always dangerously hot despite their immersion in cold water.

Obviously, the orthodox use of a lubricating oil for these bearings was ineffective. An extreme emergency had to be met. But the Shell Engineer who surveyed this job for lubrication had the answer—a water-resistant grease, easily applied with regular greasing equipment.

Results were amazing. Rollers were no longer hot after river work, the grease stayed on the tracks, and bushing replacement as well as greasing expense dropped accordingly.

The moral of this story? The finest lubricants on the market *plus* the knowledge and experience to apply them spell lubricating success! Shell provides this combination, as many case histories like the one above prove. When lubrication problems confront you—call in the men who find the answers—the Shell Engineers. Simply call or write your nearest Shell office.

SHELL CONSTRUCTION LUBRICANTS

SHELL

BAKER

HYDRAULIC BULLDOZERS AND SCRAPERS

The new models of BAKER Hydraulic, Direct-lift Bulldozers and Grade-builders are setting the pace in dependable performance. They are more than ever, the choice of leading contractors on the important construction projects.

Baker Hydraulic Scrapers (with flat digging angle) made in 2½ and 5 yard sizes are giving dirt movers new ideas about low-cost earth moving.

Ask for latest bulletins on Baker Hydraulic Bulldozers and Scrapers.

THE BAKER MANUFACTURING CO.

568 Stanford Ave. Springfield, Ill.

This New Blade-Type RIDGID Cutter Wheel ASSURES YOU Quick, Clean Low Cost Pipe Cutting

● Like the blade of a good knife, this RIDGID cutter wheel blade is made of fine tool steel — for more cutting power and stamina. It's coined, hammered, heat-treated and cast into a solid hub. Many more cuts per wheel, practically no burr... And thousands of users will tell you that this steel reinforced cutter always cuts true, twirls easily to size. For speedier better work and less cutter wheel expense, buy the RIDGID — at your Supply House.

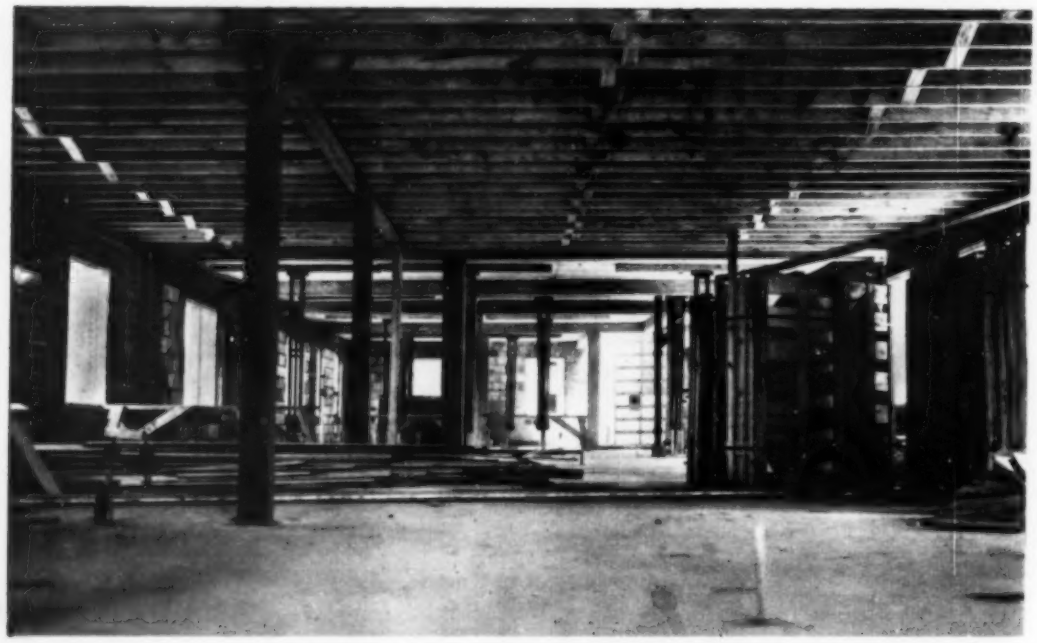
THE RIDGE TOOL CO.
ELYRIA, OHIO

RIDGID PIPE TOOLS

Olentangy Housing Project

(Continued from page 37)

ing the charging hopper, on the lower level. Aggregate trucks back up a short ramp and dump their batches directly into the open hopper. Sacked cement stored on wooden skids in the proper proportion for each batch is moved on manually-operated hydraulic-lift trucks to the charging hopper and is dumped by hand into one of two cement boxes which were provided to eliminate delays in handling this material. The truck-mixer operator on the lower level drops the charging spout into the open door of the mixer drum and, upon receiving a signal from above indicating that the hopper is full, pulls a lever discharging aggregates, cement and water into the mixer. Water is measured by a Jaeger 250-gal. metering tank on the upper platform of the plant. Charging a mixer with a 3-yd. batch takes 1 min. or less.



STEEL FRAME and wood joists of top story ceiling in foreground change to reinforced-concrete frame and floor in background, where height of building increases by one story.

On the upper level at the batching plant is a cement storage shed 30 ft. wide and 50 ft. long, with a capacity of 800 bbl. of sacked cement stored on skids. To this shed, the hauling contractor delivers the sacked cement from a railroad siding 1½ mi. distant and stores the material on the skids. To facilitate handling, the floor of the shed is built on a level with the truck tailboards at the receiving door and is pitched 6 in. in the long direction toward the charging hopper. Sacks are placed on the skids with all necks turned one way, and the loaded skids are arranged in the warehouse to simplify moving them into the central aisle and on to the charging platform in proper position for dumping.

Two Barrett 3,500-lb. lift trucks move loaded skids into storage and on to the charging platform. Employees of the hauling contractor load the skids and place them in the shed. A crew of four men operates the batching plant.

Concreting Schedule — At the end of a day's concreting at the job, the four truck mixers return to the Arrow Sand & Gravel Co.'s aggregate plant to take care of any other deliveries for which they may be needed. They park at the aggregate plant overnight and proceed to the housing project in the morning, hauling 2½-yd. batches permitted on city streets. Concrete placing on the job is continuous until a pour is completed. The concrete foreman keeps in touch with the aggregate plant by telephone and informs the plant in advance when to shut off deliveries of aggregates. Truck mixers remain on the job until the day's work is completed.

Concrete is discharged from the truck mixers into 1-yd. bottom-dump buckets which are handled by a Marion crane with a 75-ft. boom. To gain additional rear-end height for filling the buckets, the trucks back up timber ramp blocks which raise the rear wheels about 15 in. off the ground.

Progress and Rentals — Excavation for the first building of the present group started June 15, 1938, and the first tenants moved into the new apartments Sept. 15, 1938. Leases were signed for more than half of the apartments before any rooms were completed and ready for exhibit. Living units range in size from three to five rooms and rent for an average of $13 per room per month.

Administration — For the L. L. Le Veque Co., owner and builder of Olentangy Village, L. L. Le Veque is president, and H. M. Boyajohn, vice-president and works manager, directs construction planning and procedure. At the project, Roy M. Sands, general superintendent, is in charge of operations, and M. F. Ross is chief field engineer.

BLAW-KNOX CO., Pittsburgh, Pa., has prepared a bulletin, No. 1643, describing the operation of its water measuring system on Trukmixers. There is a graphic explanation of the method of water flow and control, and the results of tests conducted by an engineer of the Indiana State Highway Department, under different gage settings and with tank in level or variously tilted positions are summarized.

"We recommend HEIL DIG-N-CARRY SCRAPERS" say SATISFIED USERS

Above: One of three 12 yd. Heil Dig-N-Carry Hydraulic Scrapers in the service of Wm. Lathers, Jr., Madison, Wisconsin. Below: Note short turning radius.

Below: Heil Dig-N-Carry scraper backsloping on a 2 to 1 grade. Heil scrapers have low center of gravity to insure stability on any grade that tractor can operate on.

Below: Quick-opening, floating front-gate opens wide to permit fast unloading. "Even wet, sticky clay can be unloaded and spread without any undue delay or trouble."

WM. LATHERS, JR.
ROAD CONTRACTOR
Madison, Wisconsin

Oct. 25, 1938

Hunter Tractor & Machinery Co.,
327 S. 16th St.,
Milwaukee, Wis.

Gentlemen:

After comparing the operating efficiency of the three Heil Dig-N-Carry Scrapers that I purchased from you this past summer, with the performance of other makes that I have operated during the past four years --- I can sincerely recommend Heil Dig-N-Carry scrapers to contractors who are in the market for durable, efficient scrapers.

Heil scrapers load easier and faster than any other scraper I have ever seen working. They dig and load hard, packed soil and shale that I could not handle efficiently with other makes of scrapers without using a scarifier ahead of the scraper.

And with the installation of the new, quick-opening floating front gate these scrapers certainly do unload fast. Even wet, sticky clay can be unloaded and spread without any undue delay or trouble.

The hydraulic control system is simple to operate, trouble-proof, and is superior to any cable-winch scraper operating system I have ever had and experience with.

Very truly yours,
Wm Lathers Jr.
William Lathers, Jr.

Get complete facts NOW concerning efficient Heil Dig-N-Carry Scrapers — Address your inquiry to:

THE HEIL CO.

MILWAUKEE, WISCONSIN HILLSIDE, NEW JERSEY

MODEL P-A PLANTS ARE BUILT IN 4 SIZES

MODEL PA-15 1500# Mixer
MODEL PA-20 2000# Mixer
MODEL PA-30 3000# Mixer
MODEL PA-40 4000# Mixer

A NEW PORTABLE ASPHALT PLANT

in completely assembled sectional units easily moved by truck or rail and quickly erected without the use of a crane or gin pole.

Patents applied for **Built in 4 Sizes**

Write for Bulletin T-260

HETHERINGTON & BERNER, INC.

701-745 Kentucky Avenue **Indianapolis, Ind.**

PULL *Extra* PROFITS YOUR WAY

Handle extra work with this high-speed Michigan Truck Dragline. Fingertip Air-Controls make possible more passes per hour—greater output per day—extra profits at the end of the month. Travels anywhere a truck can go—and with truck economy.

Rugged construction, from-the-ground-up, gives Michigan the stability of heavier equipment and eliminates costly break-downs and expensive schedule interruptions. Write MICHIGAN POWER SHOVEL COMPANY, Benton Harbor, Michigan.

Custom-Tailored Sheetpile Coffers

(*Continued from page 51*)

tractor welded to the wrought-iron section, before it was lowered into position, a sufficient length of cylindrical steel shell, flanged at the lower end for attachment to the pipe nipple under water. When the welded unit was dropped into place on the nipple, a diver bolted up a watertight joint, and the shaft form was readily pumped out for concreting in the dry.

Pier Foundations — Tower piers of the suspension bridge (Pier 4 and Pier 5) are 1,028 ft apart on the two sides of the channel in Eggemoggin Reach, between Sedgwick and Little Deer Isle, Hancock County, Maine. Both piers rest on solid rock sloping toward the center of the channel. Cover material on the rock at the pier locations was shallow, ranging from 6 to 11 ft. deep.

After dredging an enlarged area at each pier site with clamshell buckets and sweeping the rock clean with pressure jets, the contractor took accurate soundings of the rock bottom, using an 80-ft steel lattice derrick boom as a plumb pole. A stadia rod was fastened to the boom, and readings were taken by instruments set up on the shore. Soundings were taken over the cofferdam area on a 5-ft. grid and at 1-ft. intervals around the perimeter to develop rock profiles for cutting the steel sheeting.

Cofferdam Design — An accompanying sketch indicates the rock profiles and cofferdam framing for pier 5. The top of base for this pier is at El. —43, and rock under the sheetpile cofferdam varies from El. —66 to El. —78, giving a range in height of wall of 23 ft. to 35 ft.

Construction of the cofferdam for pier 4 is similar to that for pier 5. The depth is less, but the rock lies on a steeper slope. Top of base is at El. —25 and rock varies from El. —44 to El. —62, producing a range in wall height from 19 ft. to 37 ft.

In both cofferdams, walls of steel sheetpiling weighing 27 lb. per square foot of pile were braced at two levels by complete horizontal frames of bolted truss bracing and, at a greater depth, by one part frame which braced the deep side. Horizontal trusses were made up of 10-in. 21.9-lb steel ship channels for main members and cross bracing. Between the tiers of horizontal trusses, the design employed 10-in. ship channels for vertical and diagonal bracing. At the three truss levels, outer wales of 10-in. wide-flange 21-lb steel beams were bolted through the sheeting to inner truss members. The sheet piles were welded together by 6-in. welds about 1 ft. above the lower tier of complete horizontal bracing.

After the cofferdams had been assembled on timber cribbing on a barge at the bridge site, welders cut the lower edges of the sheeting to fit the rock profiles.

Setting Cofferdams — The barge carrying the complete cofferdam was spotted over the pier site, with the 250-ton floating derrick *Monarch* alongside. Using a four-pennant hoisting gear hooked to toggles on the upper bracing frame, the derrick picked up the coffer with a high boom and a

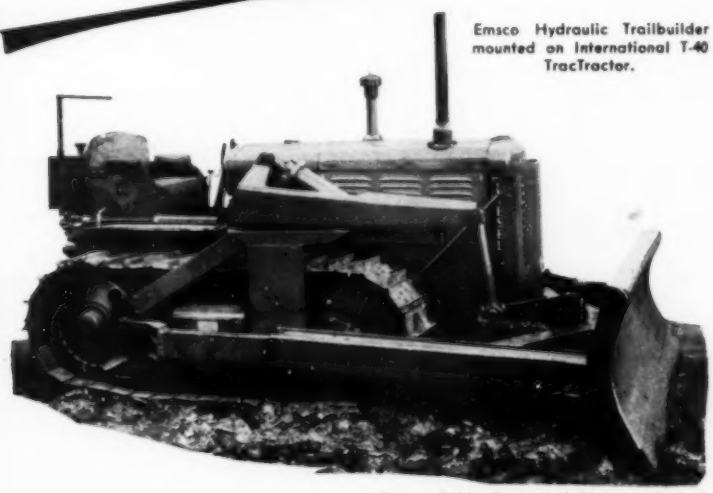
(*Continued on page 64*)

the Buckeye
TRACTION DITCHER COMPANY

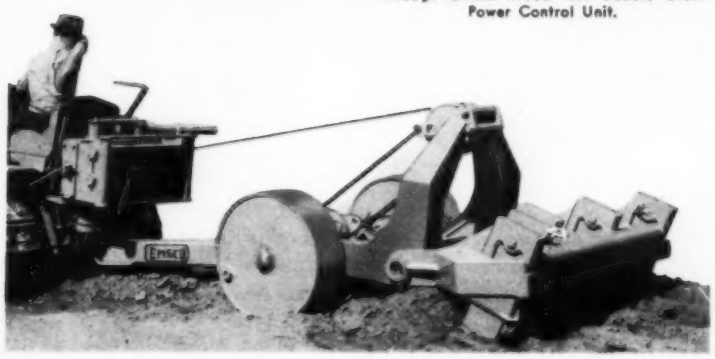
Now EASTERN
MANUFACTURERS & DISTRIBUTORS
(EAST OF THE ROCKY MOUNTAINS)
for the
TRACTOR EQUIPMENT DIVISION
of
EMSCO DERRICK & EQUIPMENT CO.
LOS ANGELES, CALIF.

EMSCO
"Equipoise"

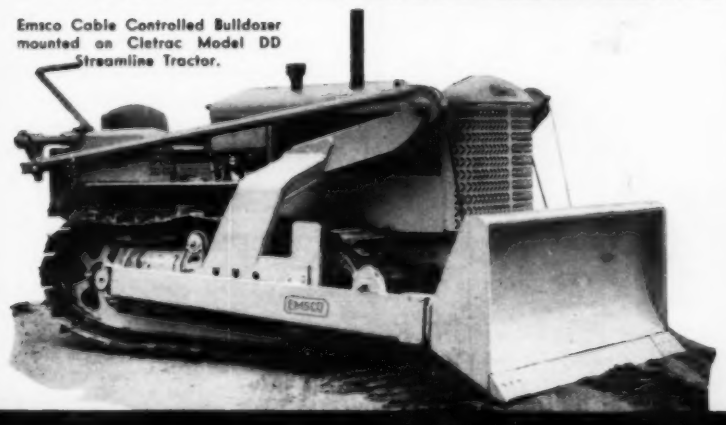
Cable and Hydraulic Controlled
BULLDOZERS • TRAILBUILDERS
ROAD RIPPERS
•
SCRAPERS • POWER CONTROL UNITS
SHEEPSFOOT TAMPING ROLLERS



Emsco Hydraulic Trailbuilder mounted on International T-40 TracTractor.



Emsco Cable Controlled Ripper operated through Emsco Model EH Double Drum Power Control Unit.

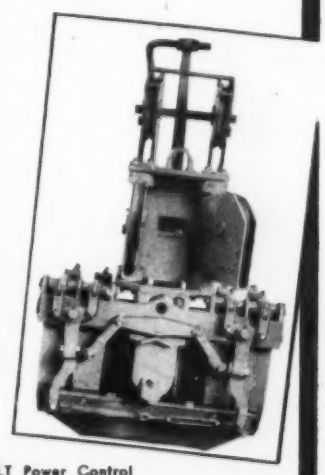


Emsco Cable Controlled Bulldozer mounted on Cletrac Model DD Streamline Tractor.

This tried-and-proven line has been designed for use with International and Cletrac track-type tractors. The ability to stand up under hard use and to keep jobs moving on schedule at minimum cost has been fully demonstrated on many outstanding engineering projects.

Patented features of design add greatly to the flexibility and speed shown by EMSCO equipment on the job. Important savings in tractor wear plus reduced cable cost with EMSCO Power Control Units on cable operated equipment contribute to low operating expense.

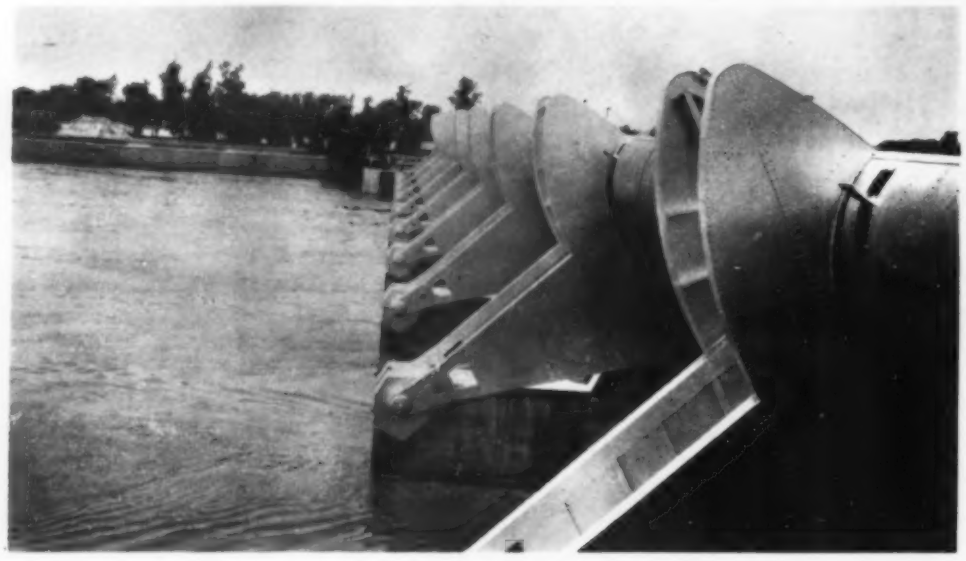
Complete information on EMSCO Equipment will be promptly supplied on request. Inquiries from the territory east of Dodge City, Kansas, in the United States, and from Canada should be directed to THE BUCKEYE TRACTION DITCHER COMPANY, Findlay, Ohio, and west of Dodge City, directed to the EMSCO DERRICK & EQUIPMENT COMPANY, Los Angeles, California.



Emsco Model GLT Power Control Unit.

THE BUCKEYE TRACTION DITCHER CO. • FINDLAY OHIO

EMSCO DERRICK & EQUIPMENT CO. • LOS ANGELES, CALIF.



THE CONTRACTORS on Dam 25 and on twenty similar projects on the Mississippi and other rivers in the United States, worked with dry subgrades which, *without exception*, remained blow-in proof because they used the Moretrench Wellpoint System. Two months ago the flood swollen Mississippi surface was some forty feet higher than the pier footings at Dam 25, but the work went on under "the best foundation condition we ever had."

THE MORETRENCH WELLPOINT SYSTEM MEANS DRY INSURANCE

There are many reasons

MORETRENCH CORPORATION 90 West Street New York City

MAKE BIGGER PROFITS with *Mall* VIBRATORS

MALL vibrator powered with gas engine. Attachments can be furnished for SURFACING, DRILLING, SAWING, PUMPING and SANDING. A multi-purpose machine!

They are earning hundreds of dollars for contractors everywhere. MALL vibrators eliminate honeycombs and expensive patching, save labor and material, and produce strong, durable concrete. There is a type and size — gas engine, air, or electric — 5000, 7000 or 10,000 r.p.m. — for each specific concrete job.

Our engineers will gladly help you select the MALL best suited for your work. No cost or obligation!

Mall Tool Company
7757 SOUTH CHICAGO AVENUE CHICAGO ILL

"WISH I'D HAD A MARTIN-DECKER TENSION INDICATOR!"

With the Martin-Decker Tension Indicator checking the lines on your job, you can tell at a glance whether they're doing their share of the work, whether they're standing up under the impact of heavy loads or of strong, steady pulls!

And, without paper calculations and without dead-ending, you can secure the information you need to reduce replacement cost of your lines to the core. *You know, because you actually measure the load as it falls on the line!*

The Martin-Decker Tension Indicator is available in three sizes for lines from ⅜" to 2¼" diameter. All sizes are adjustable for temperature changes.

Write for full details on this instrument, and ask about the Martin-Decker Measuring Line Weight Indicator.

MARTIN-DECKER CORPORATION
LONG BEACH CALIFORNIA

(*Continued from page 62*)

side lift until the steel sheeting cleared the timber cribbing and the barge could be pulled out from under its load. The derrick then lowered the cofferdam to its position on the rock bottom.

Pier 4 cofferdam fitted the rock perfectly, but pier 5 cofferdam had to be raised once to permit cutting at one place to fit a rock projection not disclosed by the soundings. A floating concrete plant tremied the base sections of the two piers in continuous pours of 1,785 cu.yd. each.

Arch Falsework — Arch forms for the 23-ft clear span of cross-strut between columns were supported by steel falsework consisting of four 24-in. I-beam stringers resting on 12-in. I-beam caps of two pairs of 14-in. and 16-in. columns going down to steel grillages on the distribution slab. The grillage under each pair of columns was made up of two 12-in. wide-flange beams bearing on solid wood blocking and wedging at El. —32.5 for pier 5 and at El. —14.5 for pier 4.

Administration — Operations were directed for the Merritt-Chapman & Scott Corp., New York contractor, by Frank W. Barnes, construction manager; R. E. De Simone, New England district manager; and William Denny, superintendent. Al Siecke, office engineer, was in charge of engineering work.

Robinson & Steinman, consulting engineers, New York, are the engineers for the bridge, represented by R. M. Boynton in the New York office and by D. G. Letourneau in the field.

The bridge is being built through the cooperation of a local bridge district, the State of Maine and the Public Works Administration. Raymond C. Small is secretary of the Deer Isle-Sedgwick Bridge District Trustees, and Lucius D. Barrows, state highway engineer, is secretary of the Joint Board Deer Isle-Sedgwick Bridge. Interests of PWA are represented by Frank Slane, senior engineer in charge of New England.

Yearly Employment

"IN THE PAST," according to A. W. Robertson, chairman of the board, Westinghouse Electric & Manufacturing Co., in an address before the Seventh International Management Congress, "management has paid scant heed to the problem of furnishing yearly employment. It has expected labor to share the ups and downs of business. If times were bad labor was unemployed. In a degree this cannot be avoided. But management, by careful planning, may be able to smooth out to an appreciable extent the ups and downs of labor. Management has been guilty of a day-to-day existence which magnifies the plight of labor. If management holds out the hope of employment today, it must not shatter that hope tomorrow. Management should be able to plan its work so that improvements, major repairs and expansion are done in periods of depression when labor might otherwise be unemployed. This means that private enterprise must have sufficient funds to carry it through depressions with confidence. Government must assist management in this laudable undertaking and should be interested in assisting it to maintain a sound financial condition rather than weakening it by unwise taxation."

(Continued from page 44)

cedure was to drill the holes at closer spacing and column-load them with dynamite, eliminating preliminary springing, to obtain better fragmentation. Depending upon the character of the rock, the powder men loaded the holes with 20 or 40 per cent dynamite, either gelatin or ammonia, or with black powder. A daily explosive consumption of 10,000 to 18,000 lb. yielded 20,000 to 25,000 cu.yd. of rock.

Foundation Piers — Four crawler cranes dug foundation pits with clamshell buckets. Spread footings for about 1,100 piers rest on shale or rock, while the remaining piers and some heavy foundations are supported by more than 2,000 USS beam bearing piles driven in an old, deep fill. Occasional sheeting of pits was necessary, but most of the holes were dry and stable. The contractor tried to complete piers in advance of filling, but it sometimes was necessary to build fill first and excavate later for the foundations.

Grouting Cinder Fill — An old cinder fill on the property presented a problem in converting the material into stable foundation. To solidify the fill, engineers of the steel corporation utilized a method, employed once before in a similar situation at the site of the America Sheet & Tin Plate plant in Wellsville, Ohio, of impregnating the cinders with special grout.

At 20x50-ft. intervals, the Pennsylvania Drilling Co., contractor for this work, drove 2-in. pipe, open at the bottom, to a maximum depth of 100 ft. into the fill. A grout mixture composed of one bag of portland cement, ten bags of first-run or unburned cement (which has a slight cementing value) and 4 gal. of water was mixed in a small concrete mixer and transferred to a special tank truck with an outlet hose at the bottom. The hose was connected to a grout pipe, and compressed air from a supply line was turned into the top of the tank at 60- to 100-lb. pressure, forcing the grout into the fill. One hole took 872 tons of grout.

Concreting Plant — To produce 250,000 cu.yd. of concrete the construction organization used one 2-yd. stationary mixer and five paving mixers, four of them 27E and one 21E. The 2-yd. stationary mixer fed a double-chamber concrete pump which forced concrete through 8-in. pipe line for distances up to 1,400 ft. A 50-ft. hoist tower attachment was used in connection with one of the 27E pavers to build small piers.

Serving the 2-yd. mixer were a 150-ton aggregate batching plant and a bulk cement plant. Two 100-ton aggregate plants, supplemented later by a third, and a second bulk cement plant batched dry materials for the paving mixers. The pavers, in addition to supplying concrete for foundation piers, laid 200,000 sq.yd. of concrete slab floors, 6, 8 and 10 in. thick. Limestone aggregate was used in all foundations except under furnaces, where slag aggregate was substituted, because heat attacks limestone.

Direction — Irvin Works was built by the Carnegie-Illinois Steel Corp., a subsidiary of the United States Steel Corp. For the Guthrie-Marsch-Peterson Co., contractor, Robert M. Knox, vice-president, A Guthrie & Co., St. Paul, Nicholas Marsch, representing John Marsch, Inc., Chicago, and Edward Peterson, president, Edward Peterson Co., Omaha, were resident managers of construction, with C. H. Taylor acting as general superintendent, J. L. Hershey as contractor's engineer and E. N. Benson as purchasing agent and office manager. The American Bridge Co., another subsidiary of the United States Steel Corp., erected the steel frame mill buildings.

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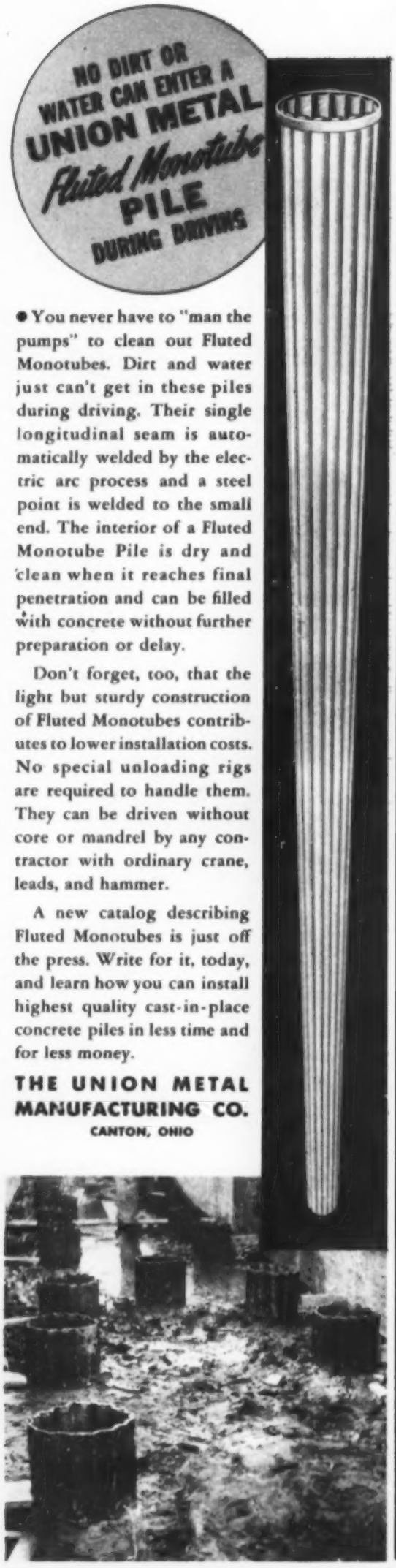

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CONSTRUCTION EQUIPMENT NEWS

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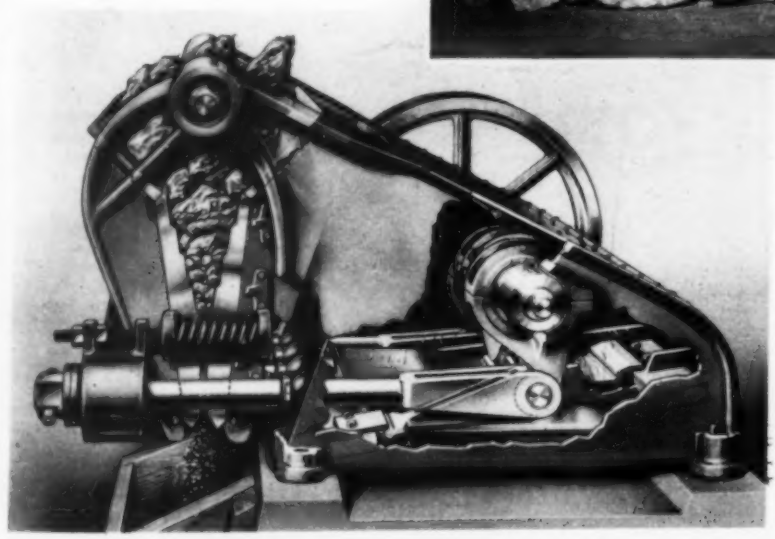
Review of Construction Machinery and Materials for DECEMBER, 1938

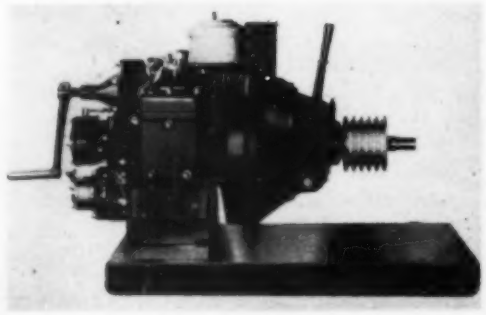
SINGLE REDUCTION (right) from coarse to fine stone is accomplished by new type of balanced jaw crusher.



JAW CRUSHER (left) equipped with two long balanced jaws produces in single operation fine stone that ordinarily would require primary crusher followed by one or two secondary crushers.

NEW TYPE OF JAW CRUSHER for quantity production of fine stone has been introduced under name of Kue-Ken balanced crusher. New unit, it is claimed, can produce in single operation finished product that ordinarily would require primary crusher followed by one or two finishing machines. Crushing principle in this machine involves use of two long balanced pendulum jaws, each traveling short distance and swinging toward each other in perfect rhythm so that rocks are instantly gripped, thrust down without abrasion, crushed and released. Upper ends of jaws travel through shorter distance than lower ends, thus insuring maximum leverage on largest rock and longest jaw travel on large volume of smaller material at lower end. As illustrated in photograph, mechanism includes sturdy steel shaft, two outer compression pitmans, which push down, and, between them, one inner tension pitman which pulls up, thus balancing the entire movement. Balanced toggles give rapid movement at start of jaw travel, then slow down for easy crushing of hardest rock. Design produces powerful leverage; no flywheel is necessary. Compact design cuts down headroom and floor space required. Forced feed lubrication.

On crushing element, cheek plate design accelerates passage of material to crushing zone and jaw plates are held by adjustment device to permit wear down to minimum thickness. Crusher weighs 11,000 lb., has 24x9-in. opening and operates at 365 r.p.m. Capacities range from 45 tons per hour (21-in. quartz, crusher jaw set at 3 in., 13 hp. actually used, 2 per cent of minus 8 mesh in crusher discharge) to 13⅓ tons per hour (8-in. hard basalt, crusher jaw set at ⅛ in., 40 hp. actually used, 24 per cent of minus 8 mesh in crusher discharge.) — **Straub Manufacturing Co., 531 Chestnut St., Oakland, Calif.**



COVIC DIESEL ENGINES are offered for all types of construction and material-handling equipment using up to 20 hp. and requiring clutch between engine and driven unit. Type T-2-PC power unit is two-cylinder machine with bore and stroke of 3 5/32x 3 15/16 in. Cubic displacement, 61.2 cu.in. Full pressure lubrication. Fuel injection is by Bosch pumps actuated from camshaft; injection nozzles are pintle, non-choking type. Specially developed turbulence chamber is patented feature. Fuel consumption is 0.38 to 0.42 lb. of 27 to 32 deg. Baume fuel oil per horsepower-hour. Hand cranking eliminates accessory equipment. Decompressor lifts exhaust valves and makes starting of engine by hand crank easy. Net weight, with standard equipment, 670 lb. All moving parts except pulley are totally inclosed. — **Northill Co. (Covic Diesel Division), 5221 West San Fernando Road, Los Angeles, Calif.**

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Get in touch with your nearest distributor—for a clean engine, and long hard service with the minimum of overhaul.

Pusher Tractor In Loading Pit

(Continued from page 53)

Faster Loading — Naturally the first thought was to add more tractor and scraper outfits, but a more careful analysis of the problem led the contractors to believe that it would be cheaper to speed up the existing scrapers during the loading period. Accordingly, they put into operation an 80-hp. pusher tractor, with startling results.

Instead of loading in 90 sec., the time was cut to 48 sec., and loading distance was reduced from 150 to 80 ft. As a result of adding the single tractor, yardage jumped from 332-yd. per hour on an 800-ft. round trip haul to 500 yd. per hour over the same distance. The following table presents a clear picture of the remarkable increase:

WITHOUT PUSHER-TRACTOR	
Haul (round trip)	800 ft.
Payload per scraper	8 yd.
Loading time	1.5 min.
Loading distance	150 ft.
Yardage per hour (four scrapers)	332 yd.

WITH PUSHER-TRACTOR	
Haul (round trip)	800 ft.
Payload per scraper	11 yd.
Loading time	0.8 min.
Loading distance	80 ft.
Yardage per hour (four scrapers)	500 yd.

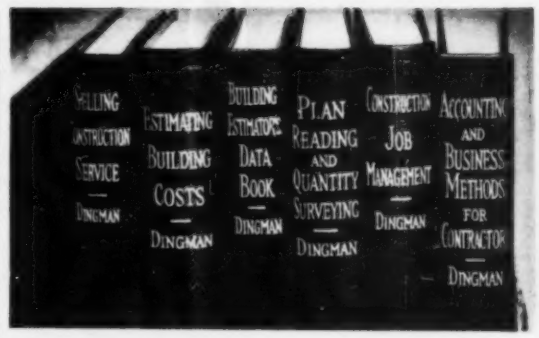
Economies — To move an equivalent amount of earth in the same period of time would require six tractor-scraper outfits instead of the four actually used. In other words, by adding the single pusher-tractor to handle the four scrapers, Hudkins and Perry saved themselves the investment in two scrapers and one tractor, yet did an equal amount of work. Elimination of one tractor and two scrapers cut dirt-moving costs as well as many fixed charges. First, fixed equipment investment was reduced. Second, operating expenses (labor, fuel, lubricating oil, grease, maintenance, etc.) for one tractor were eliminated. Third, maintenance and upkeep on two scrapers were saved.

Under conditions where the average tractor-scraper would stall, the pusher supplied enough power to load the scraper from start to finish without delay. This extra power relieved the pulling tractor from the strain of loading and thereby reduced the maintenance cost of all the tractors on the job. The contractors estimate that the life of tractor steering clutches and master clutches was doubled after the addition of the pusher tractor.

Of particular advantage in this type of operation, point out Hudkins and Perry, is the hydraulic type of scraper, because the cutting edge can be forced down into the earth to get a full, deep bite. By forcing the cutting edge into the earth, the scraper can be loaded faster and in less distance.

Pusher Operation — Tractor-scraper operation was not materially altered by the use of the pusher. The scraper operator drove his machine into the borrow pit in the usual manner, with as little lost motion as possible, and, as soon as the cutting edge was lowered into the ground, the pusher went to work. Its power was exerted in full on the scraper during the entire loading operation. As soon as the load was complete, the pusher returned

(Continued on page 70)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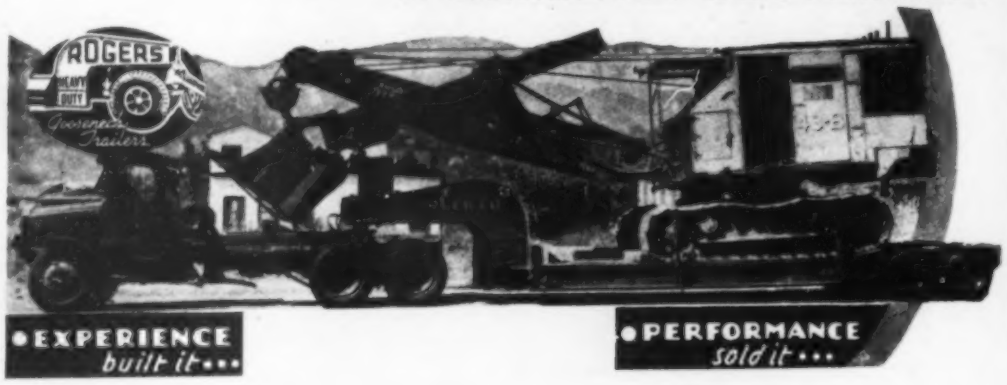

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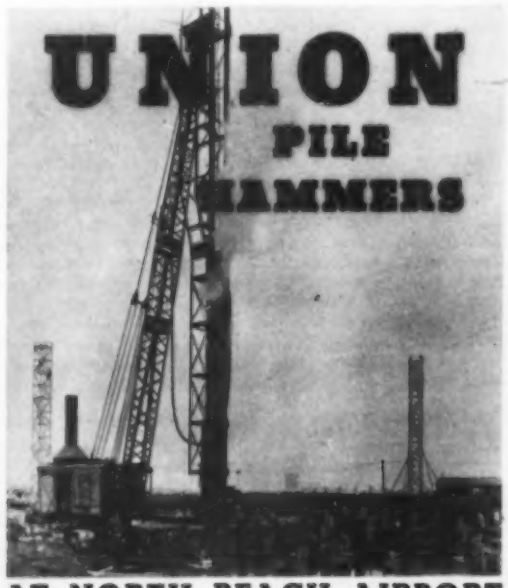

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THE MOST DEPENDABLE PUMPS FOR THE LEAST MONEY

WRITE

THE GORMAN-RUPP CO., Mansfield, Ohio

(Continued from page 69)

to the loading end of the pit in readiness to handle the next scraper. To eliminate lost time between scraper fills, the pusher had to be ready to go.

Teamwork Essential — Experience on the job indicated the importance of stressing certain details if maximum efficiency is to be obtained in the pusher operation. The two men involved in the operation are actually a team, and for best results it is essential that they cooperate.

When entering the pit, the scraper operator must indicate by signal or understanding where he is to take his cut. He must maneuver his tractor quickly and accurately. The pusher operator must have his tractor in position the moment the scraper bowl is in the loading position. All unnecessary shock from the pusher must be eliminated to prevent strain on the tractor-scraper. Any good operator can become efficient on a pusher set-up.

Timing or spacing between scrapers must be designated accurately and held closely. The foreman must be "on his toes" at all times to redirect the scrapers when contingencies arise. On the Hudkins and Perry job one scraper was loading, one hauling to the fill, one dumping and one returning to the pit. This spacing is suitable for any length haul when four units and a pusher are used.

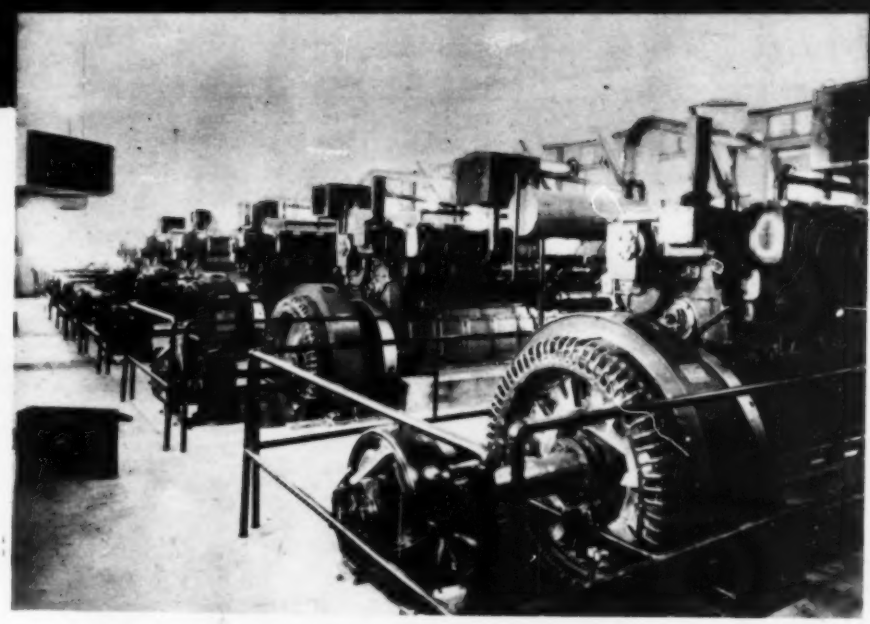
When the haul is short there are occasionally two scrapers in the pit at the same time. This situation cannot be avoided, and the only solution is for the pusher to work the scraper which arrives first. The second scraper can begin its loading in the conventional manner with the pusher coming to its assistance as quickly as possible. It is desirable to have a pusher-tractor with a travel speed of about 6.5 mi. per hr. The length of haul determines whether or not two scrapers are loading in the pit at the same time. Long hauls — up to 2,000 feet — were used on the Iowa job, and in this case the pusher had to wait.

Pusher Tractor — The four tractors drawing scrapers on the Iowa job were Allis-Chalmers Contractor's Special L-O's, standard 6.5-m.p.h. machines equipped with heavy-duty guarding equipment. The pusher L-O was also a Contractor's Special, the only difference being in the replacement of the standard bumper. A new bumper 36x 32x⅝-in. steel plate was mounted slightly below the position of the standard bumper. Because of the plate's size and position there was little danger of misalignment between the tractor and scraper bumpers. Clearance of 18 in. was provided between the lower bumper edge and the ground surface.

A principal feature of the pusher-bumper was the use of two large coil springs to absorb the shock of contact between the tractor and scraper. The bumper was suspended on two swinging arms from the engine crankcase so that it was free to move parallel with the tractor but was held rigidly at all times with respect to the ground. In the rear, the springs and guide rods were fastened securely to the tractor at the same point as the tractor drawbar. When a load was applied to the bumper, the coil springs absorbed the initial impact and transmitted the force of the tractor directly from the drawbar to the scraper through the bumper frame.

Scrapers — Welded to the rear frame crossmember of each of the scrapers, standard Gar Wood L-12's with built-up sides, was a tapered box section bumper. The bumper extended out clear of the rear wheels of the scraper. The small end, against which the tractor exerted its force, carried a replaceable wooden pad. This pad, approximately 12x18 in. presented a replaceable, shock absorbing surface.

Power FOR CONCHAS DAM



DEPENDABLE power for both construction work and domestic purposes at Conchas Dam, in New Mexico, comes from these G-E generators, as no large commercial source of power is available within many miles. Construction machinery of Bent Brothers, Inc. ,and Griffith Company, homes for 128 families, and dormitories for 1,500 single employees all are furnished with current from this plant.

Adequate power supplies for construction projects not only provide electricity for the safe operation of heavy construction machinery, but also speed the performance of scores of minor tasks. For example, could you not profitably use welding equipment for thawing frozen pipes, heating cable to keep new concrete from freezing, immersion heaters to keep the oil warm in trucks or tractors on cold nights?

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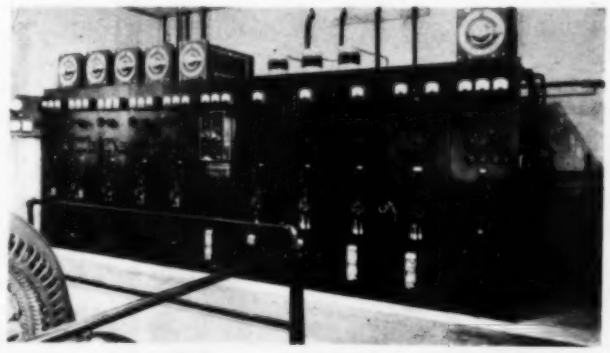
The G-E switchboard at Conchas Dam that controls the generators and cuts them in and out as needed



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Rapid Winter Curing *of Bridge Deck Concrete*

(*Continued from page 39*)

unsatisfactory result indicated either that heat under the covering was still insufficient or that additional covering was needed to prevent the dissipation of heat. Before adding another boiler, the contractor decided to try additional covering. At the same time, to utilize heat to best advantage, he also switched to Incor 24-hr. cement. As a result, the heating period was reduced from 72 to 30 hr., or less. With Incor cement, State engineers required that freshly-placed concrete be protected for 30 hr. at 70 deg., or until a flexural stress of 400 lb. per square inch was obtained by beam break.

For the next pour, straw mats made out of pieces of burlap about 10 ft. square, so tacked that the straw would not "ball up," were used as insulators on top of the tarpaulins. As an added safeguard against heat loss, another covering of tarpaulins was placed over the straw mats.

Heat-Protection Steps—In its improved form, the heat-protection job involved the following steps: (1) Steam jets were placed on the under side of the floor system; these jets were in operation while concrete was being placed; (2) after finishing the concrete, transverse steam jets were placed at the top surface of the concrete; these jets were suspended on 8-ft. centers from 4x6-in. and 1x8-in. bracing which spanned the width of the new concrete; (3) over this bracing was placed a covering of tarpaulins, a layer of straw mats and, on top of the mats, another covering of tarpaulins; (4) as soon as the covering was completed, the steam jets were turned on. Thermometers were placed in places accessible for reading, and test beams were placed under the covering at points where it was expected temperatures would be lowest during the heating period.

On the next pour after this system was operating, results after 30-hr. heating were as follows: Average curing temperature under the covering was 52 deg., with air temperatures averaging 26 deg.—maximum 31 deg., minimum 22 deg. Beam breaks gave the following flexural strengths: After 22 hr., 341 lb. per square inch; after 43 hr., 500 lb.; after 52 hr., 666 lb.

The 52-deg. curing temperature did not represent the true efficiency of the heat-protection system, however, because on the sidewalk pours it was necessary to inclose the lower chords of the trusses as well as portions of diagonal and vertical members of the trusses with sidewalk concrete; and, in doing so, the covering was raised several feet above the top surface of the new concrete, forming heat pockets. Openings around the diagonal and vertical steel members also allowed heat to escape.

When this condition was corrected on the next pour average curing temperature under the covering was 90 deg., with average air temperature

30 deg. — maximum 36 deg., minimum 24 deg. Beam breaks on this pour were: For 12 hr., 241 lb. per square inch; 24 hr., 362 lb.; 30 hr., 461 lb.; and 46 hr., 762 lb. At last the problem seemed to be solved, as indicated by these beam breaks at sub-freezing temperatures.

But, on Dec. 4, on the next sidewalk pour, average curing temperature fell to 57 deg. under the covering, with air temperature averaging 25 deg. — maximum 32 deg., minimum 20 deg. Beam breaks: At 12 hr., 222 lb. per square inch; 44 hr., 516 lb.; and 72 hr., 614 lb. The explanation was found in escaping heat around truss members.

Embedded Water Bottles — At this point State engineers expressed doubt as to the possibility of heat being conducted through the green concrete from the top surface to the bottom of the slab, and requested that if possible, temperatures be raised at the bottom surface of the concrete.

On Dec. 8 and 9, when the next pour was completed, the project engineer placed five hygeia nursing bottles in the green concrete, at regular intervals throughout the span. These bottles were embedded to the full depth of the slab, and about 2 oz. of water was placed in the bottom of each bottle; then a thermometer was placed in the bottle, and a rubber cap was fastened over the neck, making the bottle airtight. Thermometers were placed on top of the concrete next to the bottles. After about 24 hours' curing, the following data were recorded: Average temperature in the bottles, 85 deg.; at top surface of the concrete, 101 deg.; average air temperature, 31 deg. — maximum 39 deg., minimum 27 deg. Beam breaks were: For 12 hr., 275 lb. per square inch; 24 hr., 426 lb. There was a difference of 16 deg. between the bottles and surface temperature. It is also interesting to note that after the covering on his pour was removed at 8:30 a.m. on Dec. 10, temperatures in the bottles recorded 88 deg.; at 10:30 a.m., 78 deg.; at 1:00 p.m., 68 deg.; at 5:00 p.m., 54 deg. and at 8:30 p.m., 46 deg. Air temperature during this time ranged from 30 to 38 deg. Without considerable heat in the new concrete, the small amount of water in the bottles would have cooled to atmospheric temperature in a much shorter time.

Thermometers in Curbs — On the next pour, Dec. 12, thermometers were cast in the concrete sidewalk curbs and an average curing temperature of 81 deg. recorded. Average air temperature during this curing period was 30 deg. — maximum 36 deg., minimum 26 deg. Beam breaks were: For 25 hr., 476 lb. per square inch; and for 43 hr., 597 lb. per square inch.

On the next pour, no bottles were placed in the concrete, as the previous bottle tests, recording actual concrete temperatures at the bottom of the slab, had proved that heat was being conducted through the freshly-placed concrete.

During the December 15 pour, thermometers under the covering recorded an average curing temperature of 78 deg. Average air temperature was 36 deg. — maximum 40 deg., minimum 32 deg. Beam breaks: For 25 hr., 526 lb. per square inch; and for 43 hr., 598 lb. per square inch. There was no curing on any beam after 25 hr.

On Dec. 17, a sidewalk pour was made, and, with thermometers cast in the curbs, the following data were recorded: Average curing temperature 78 deg., average air temperature 29 deg. — maximum 32 deg., minimum 26 deg. Two beam breaks at 24 hr. showed 388 and 419 lb. per square inch.

Second Water Test — Before making the next pour, the supervising engineer informed the proj-

(*Continued on page 74*)

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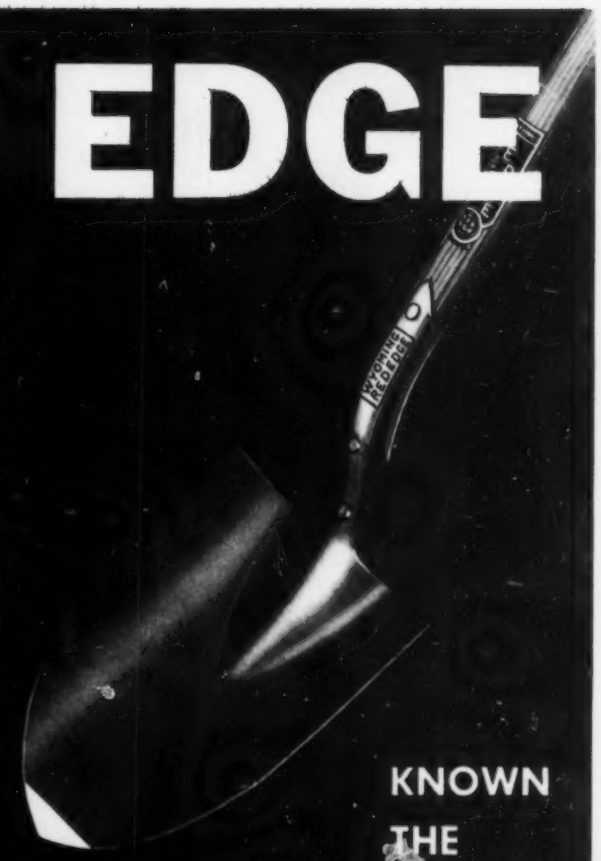

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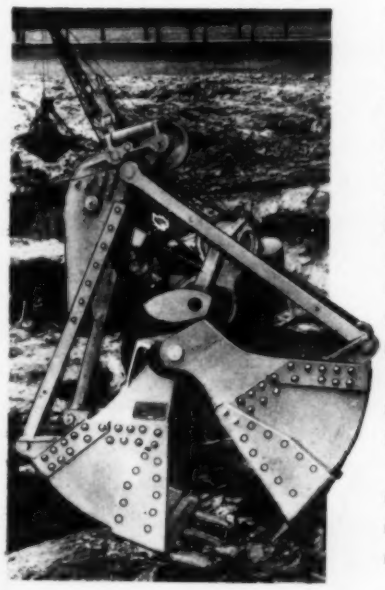

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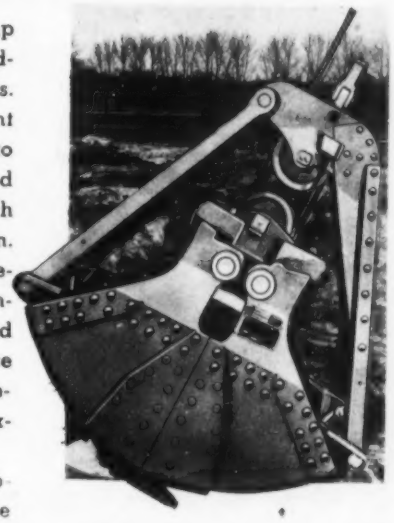

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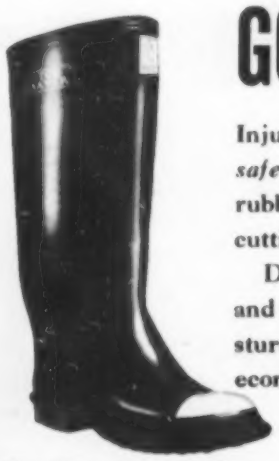

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(Continued from page 73)

ect engineer that the data obtained in the bottle test were not sufficient evidence that heat was being conduced through the slab because there was too much possibility of heat conduction through the glass bottle. Another test therefore was devised: Holes 2 in. in diameter and the depth of the slab were cast in the green concrete down to the floor lagging. The pipes were left in place until the concrete had set sufficiently to permit their being withdrawn without causing the concrete to slump and fill up the hole. A small glass about 2 in. high and the same in diameter was placed in the cast hole, the glass resting on the floor form. About 1 oz. of water was placed in each glass with a thermometer, and a heavy tapered wood plug was forced in the top of the hole to seal it. Thermometers also were placed on top of the green concrete adjacent to the holes containing the glasses.

With this procedure the following data were obtained: Average curing temperature at the top surface, 90 deg.; in the glasses, average temperature 77 deg.; average air temperature 31 deg. — maximum 34 deg., minimum 26 deg. Beam breaks: At 25 hr., 445 and 496 lb. per square inch; at 42 hr., 503 and 510 lb. per square inch. It is interesting to note that when heating ended at 4:00 p.m. on December 20 the thermometers in the glasses recorded 48 deg., air temperatures 28 deg.; at 3:30 p.m. on the following day the glasses recorded 39 deg., air temperature 32 deg. In other words, in almost 24 hr. with temperatures at freezing and below, the slab had not cooled to atmospheric temperature. It appears that the readings in the glasses gave conclusively the temperatures at the bottom of the slab.

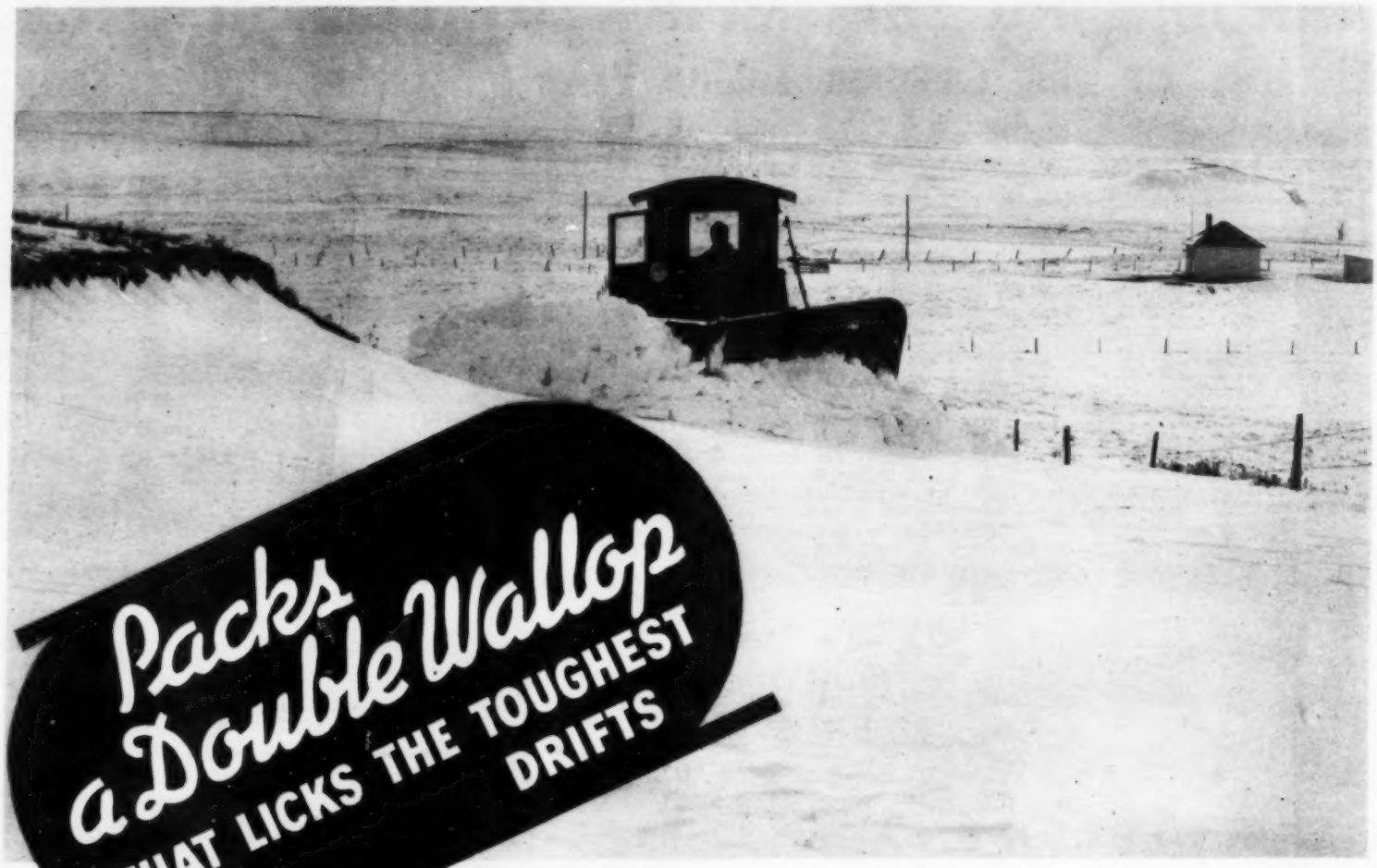
Dec. 21 Sidewalk — On the next sidewalk pour, December 21, thermometers were cast in the green concrete curbs, and the following data resulted: Average curing temperature 82 deg.; average air temperature 25 deg. — maximum 38 deg., minimum 14 deg. Beam breaks at 30 hr., 606 lb. per square inch.

Dec. 23 Roadway — The next roadway slab pour was on Dec. 23. Holes were cast in the slab and thermometers placed. The following data were obtained: Average curing temperature at top surface of concrete 92 deg.; average temperature in glasses 77 deg. Air temperature averaged 39 deg. — maximum 40 deg., minimum 39 deg. Beam breaks at 24 hr., 522 and 554 lb. per square inch. The covering on this slab was removed at 2:00 p.m. Dec. 24. At that time the glasses recorded a temperature of 54 deg.; at 4:30 p.m., 54 deg., air temperature 42 deg.; at 9:15 p.m., 52 deg., air temperature 38 deg.

Dec. 28 Sidewalk — On the next sidewalk pour, Dec. 28, average curing temperature with thermometers cast in the curbs was 70 deg. Average air temperature, 35 deg. — maximum 36 deg., minimum 34 deg. Beam break at 30 hr., 412 lb. per square inch.

Dec. 29 Roadway — On the remaining roadway pour, Dec. 29, holes were cast in the slab and thermometers placed therein. The following data were recorded: Average curing temperature at top surface 90 deg.; average temperature in the glasses at the bottom of the slab 75 deg. Average air temperature 52 deg. — maximum 57 deg., minimum 48 deg. Beam breaks at 24 hr. showed 520 and 540 lb. per square inch. Because mild temperatures prevailed during and after this pour, readings in the glasses were not taken after curing ended at the 24-hr. period. However, the relationship between the thermometers in the glasses at

(Continued on page 78)



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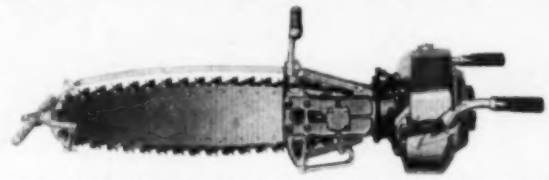

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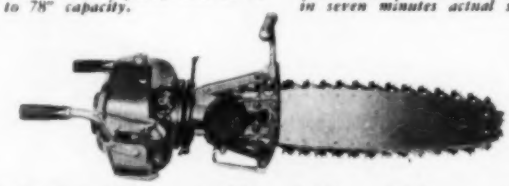

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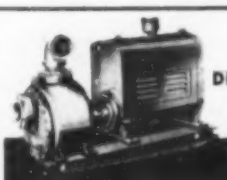

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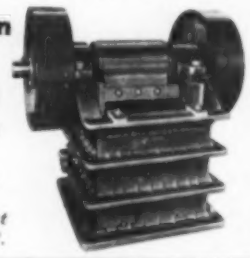

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Type H

• *Write for full particulars specifying make, model, size and year of shovel.*

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166 Race St. Holyoke, Mass.

(Continued from page 74)

the bottom of the slab and those at the top surface remained almost the same as in the case of the other pours — that is, they varied by about 15 to 17 deg.

Dec. 31 Sidewalk — The contractor made his last pour with the heating system Dec. 31. Thermometers cast in the concrete curbs showed an average curing temperature of 56 deg. Atmospheric temperature averaged 33 deg.—maximum 34 deg., minimum 32 deg. Beam breaks showed 520 and 564 lb. per square inch.

Summary — Thus ended the final chapter in a cold-weather concreting job which, from the standpoint of heat protection, presented unusual complexities. The problem was solved by practical common sense and persistence, and the results proved that sound methods and careful workmanship pay dividends in sub-freezing concrete operations.

Choice of Incor high-early-strength cement was a turning point in working out the solution. The heat-protection system was so well handled that, as soon as beam breaks showed more than 400 lb., usually in 24 hr., curing was discontinued. Rapid curing enabled the contractor to re-assemble steam lines the same afternoon, saving overnight firing of boilers and at least one day's delay on each pour, — a total saving for the job of two weeks' boiler fuel and labor. Fixed time charges and job overhead were correspondingly reduced. Equally important, the development of high strength at early periods was a constant safeguard against the failure of any phase of the complex system of heat protection.

Distinctive Color

For Traffic Danger Points

DISTINCTIVE COLOR is a primary factor in reducing night traffic accidents, Trent German, coordination chairman for the safety committees of the United States Junior Chamber of Commerce, pointed out recently in talking before the Western Safety Conference at Los Angeles. Referring to a recent survey of certain night danger points in Southern California, he declared that it "indicates without question the value of adequate illumination of a distinctive color as a means of reducing the ever-increasing number of night accidents at these known danger points. This study was confined to some 1,000 night danger points, 300 of which employed the use of distinctive color danger point lighting. Locations such as important intersections, underpasses, overpasses, bridges, railroad crossing, and curves were included in the survey."

Mr. German pointed out that the survey evidence agrees with similar results from studies made by General Electric engineers. "The night accident prevention equipment studied has in a majority of cases been the sodium vapor lamp in pendent type luminaires," he said. "Indications are that motorists recognize this distinctive (orange-yellow) color at night danger points and approach the locations fully aware of existing danger."

Committee members have made many observations of the reaction of motorists to these distinctive safety lights in the immediate vicinity of night accident zones at locations where hundreds of cars pass every hour, Mr. German explained. In almost every case the motorist recognized the warning color and approached the friction area with his automobile under control, he concluded.

CONSTRUCTION Methods and Equipment

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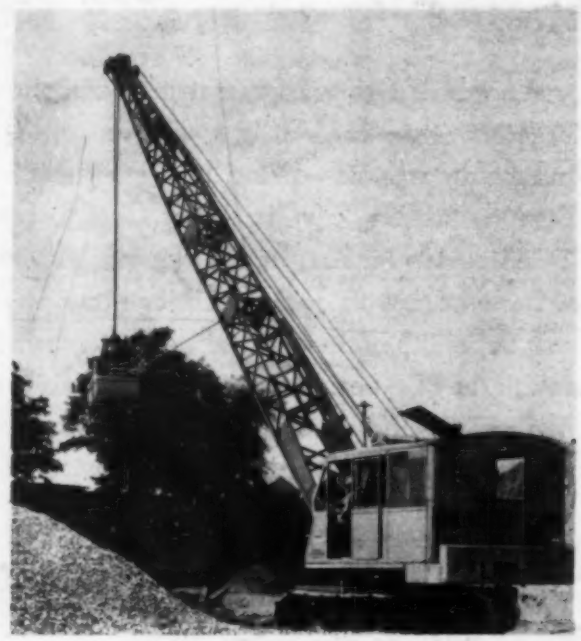

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